Monitoring, Evaluation, and Quality Assurance Plan

APDES Permit No. AKS-052558

MUNICIPALITY OF ANCHORAGE
WATERSHED MANAGEMENT PROGRAM

January 2021

Monitoring, Evaluation, and Quality Assurance Plan
APDES Permit No. AKS-052558

MUNICIPALITY OF ANCHORAGE
WATERSHED MANAGEMENT PROGRAM

January 2021

Prepared for: Alaska Department of Environmental Conservation
Division of Water

Prepared by HDR, Inc.
2525 C Street, Suite 500
Anchorage, AK 99503

and

Municipality of Anchorage
Project Management and Engineering Department
Watershed Management Services

A. Project Management Elements

A.1 Title and Approval Page

________________________________ **Date________**

Kyle Cunningham
Municipality of Anchorage Watershed Management Services
Project QA Officer

________________________________ **Date________**

Kristi Bischofberger
Municipality of Anchorage Watershed Management Services
Project Manager

________________________________ **Date________**

Gene McCabe
Alaska Department of Environmental Conservation
Program Manager

________________________________ **Date________**

John Clark
Alaska Department of Environmental Conservation
QA Officer

________________________________ **Date________**

Cindy Helmericks
HDR, Inc.
Contract Project Manager/Contract QA Officer

A.2 Table of Contents

Tables

Figures

Appendices

Appendix A	Pesticide Screening Monitoring Plan
Appendix B	Stormwater Outfall Monitoring Plan
Appendix C	Snow Storage Site Retrofit Monitoring Plan
Appendix D	Low Impact Development Pilot Project Monitoring Plan
Appendix E	Dry Weather Screening Monitoring Plan
Appendix F	Standard Operating Procedures
Appendix G	Maintenance and Calibration of Equipment
Appendix H	Street Sweeping Monitoring Plan

List of Acronyms

ADEC	Alaska Department of Environmental Conservation
APDES	Alaska Pollutant Discharge Elimination System
BMP	Best Management Practice
C	Celsius
CoC	Chain of Custody
DO	Dissolved Oxygen
DMR-QA	Discharge Monitoring Report – Quality Assurance
DOW	Division of Water
DQO	Data Quality Objective
EPA	U.S. Environmental Protection Agency
GIS	Geographic Information System
GPS	Geographic Positioning System
MDL	Method Detection Limit
MQO	Method Quality Objective
MOA	Municipality of Anchorage
MS4	Municipal Separate Storm Sewer System
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NPDES	National Pollutant Discharge Elimination System
PQL	Practical Quantification Limit
QA	Quality Assurance
QAP	Quality Assurance Plan
QC	Quality Control
QMP	Quality Management Plan
RL	Reporting Limit
RPD	Relative Percent Difference
RSD	Relative Standard Difference
SOP	Standard Operating Procedure
TAH	Total Aromatic Hydrocarbons
TMDL	Total Maximum Daily Load
WMS	Watershed Management Services

Record of Revisions

Date	Section	Description
June 4 2012	All, except App D	Updated for the 2012 season
Oct 2012	All, except App D	Final for 2012 season
Jan 2016	All, except App G and H	Updated to reflect new APDES Permit
Jan 2018	Main Body	Updated to reflect new personnel on the project
Jan 2021	All, except App C, D and H	Updated to reflect new APDES Permit

A.3 Distribution List

Signees listed in Section A.1 shall receive a copy of this Quality Assurance Plan (QAP), all attachments, and all subsequent revisions. Offers of official copies of this QAP and any subsequent revisions will be extended to individuals on the Distribution List in Table 1.

Table 1. Distribution List

Name, Title	Position	Agency	Division/ Branch	Contact Information
Kristi Bischofberger, Watershed Program Manager	MOA Project Manager	MOA	WMS	(907) 343-8057 BischofbergerKL@ci.anchorage.ak.us
Kyle Cunningham, Watershed Specialist	MOA Project QA Officer	MOA	WMS	(907) 343-8026 CunninghamKB@muni.org
Cindy Helmericks	Contract Project Manager/Contract QA Officer	HDR	Water Business Group	(907) 644-2017 cindy.helmericks@hdrinc.com
Alena Gerlek	Contract Sampling and Analysis Manager	HDR	Water Business Group	(907) 644-2122 alena.gerlek@hdrinc.com
Justin Nelson	Contract Laboratory Project Manager	SGS	Environmental Business Line	(907) 562-2343 justin.nelson@sgs.com
Stephen Ede	Contract Laboratory QA Officer	SGS	Environmental Business Line	(907)562-2343 stephen.ede@sgs.com
Gene McCabe, Program Manager	ADEC Program Manager	ADEC	DOW Wastewater Discharger Authorization	(907) 269-7580 gene.mccabe@alaska.gov
John Clark	ADEC QA Officer	ADEC	DOW Water Quality Standards, Assessment and Restoration	907.269.4913 john.clark@alaska.gov

MOA = Municipality of Anchorage; WMS = Watershed Management Services; QA = Quality Assurance; HDR = HDR, Inc.; SGS = SGS North America, Inc.; ADEC = Alaska Department of Environmental Conservation; DOW = Division of Water

A.4 Key Contacts and Responsibilities

The Municipality of Anchorage (MOA) Watershed Management Services (WMS) will appoint a person to serve as the MOA Project Manager. This person will oversee the projects described in the monitoring plans appended to this QAP, provide technical support, QAP review, review of any modifications of the proposed sampling plans, and review all reports. She/he will appoint the sampling crews from MOA staff or develop a contract to perform the sampling and reporting tasks associated with this QAP. The MOA Program Manager will also appoint the MOA Project Quality Assurance (QA) Officer, who will be charged with reviewing data validated by the Contract QA Officer to ensure quality objectives are met and data entry is conducted appropriately.

Kristi Bischofberger, MOA Project Manager will oversee the overall monitoring program and projects conducted to comply with Alaska Pollutant Discharge Elimination System (APDES) Municipal Separate

Storm Sewer System (MS4) permit AKS-052558 and this QAP. She will provide or ensure adequate resources for the overall monitoring program, including direct contracting with a laboratory.

Monitoring Contractor MOA will hire a contractor to oversee and implement the monitoring projects. The Contractor will provide a Project Manager, a QA Officer, a Sampling and Analysis Manager, and field crews.

> **Contract Project Manager** will ensure that all aspects of this QAP are implemented in conducting the monitoring projects; appoint a qualified Contract QA Officer; assign qualified and trained field crews; and interface with the MOA Program Manager.
>
> **Contract QA Officer** will ensure or provide training to, examinations for, and oversight of the field crews; perform QA and quality control (QC) review and validation of the laboratory and field data; and provide QA review of the data entered into the spreadsheets and databases.
>
> **Contract Sampling and Analysis Manager** will provide direction to the field crews and will coordinate with the Laboratory Project Manager. This person will receive direction from the Contract Project Manager and will receive feedback from the Contract QA Officer. The Contract Sampling and Analysis Manager will: ensure that all equipment is functional prior to field sampling; ensure all supplies are available and that calibration chemicals have not exceeded their expiration dates; and assist in training field sampling crews, as needed.
>
> **Field crews** will be either MOA staff or will be hired as contractors to conduct the work. Crews will be led by the Field Staff Lead(s). Trained field crews will collect samples for the monitoring projects in compliance with the permit and this QAP. If field crews are appointed by the MOA Project Manager, they will be integrated into the contractor field crews and receive the same training and oversight.

Contract Laboratory The Contract Project Manager will contract with a laboratory that will perform the chemical analyses and meet the precision, accuracy, and completeness requirements of this QAP. The contract laboratory must be currently certified for parameters of interest under the Alaska Department of Environmental Conservation's (ADEC) Drinking Water Program[1] or be certified for water/wastewater analytes by a National Environmental Laboratory Accreditation Conference accrediting body or the State of Washington Department of Ecology Laboratory Accreditation program[2] to perform the analyses required. The laboratory will deliver results to the Monitoring Contractor in an electronic format. The laboratory will provide a Project Manager and a QA Manager.

> **Laboratory Project Manager** will be responsible for the overall technical and contractual management of this project. This person will receive day to day direction from the Contract Sampling and Analysis Manager concerning the arrival of samples, turnaround times, and reporting of deliverables, and will receive feedback from the Laboratory and Contract QA Officers. This person will oversee and coordinate analyses within the laboratory and provide results to both the Contract Sampling and Analysis Manager and the Contract Project Manager.
>
> **Laboratory QA Manager** is responsible for the QA/QC of the water quality laboratory analyses as specified in the QAP. Along with the Laboratory Project Manager, the Laboratory QA Officer will review and verify the validity of the sample data results as specified in the QAP and appropriate U.S. Environmental Protection Agency (EPA)-approved methods.

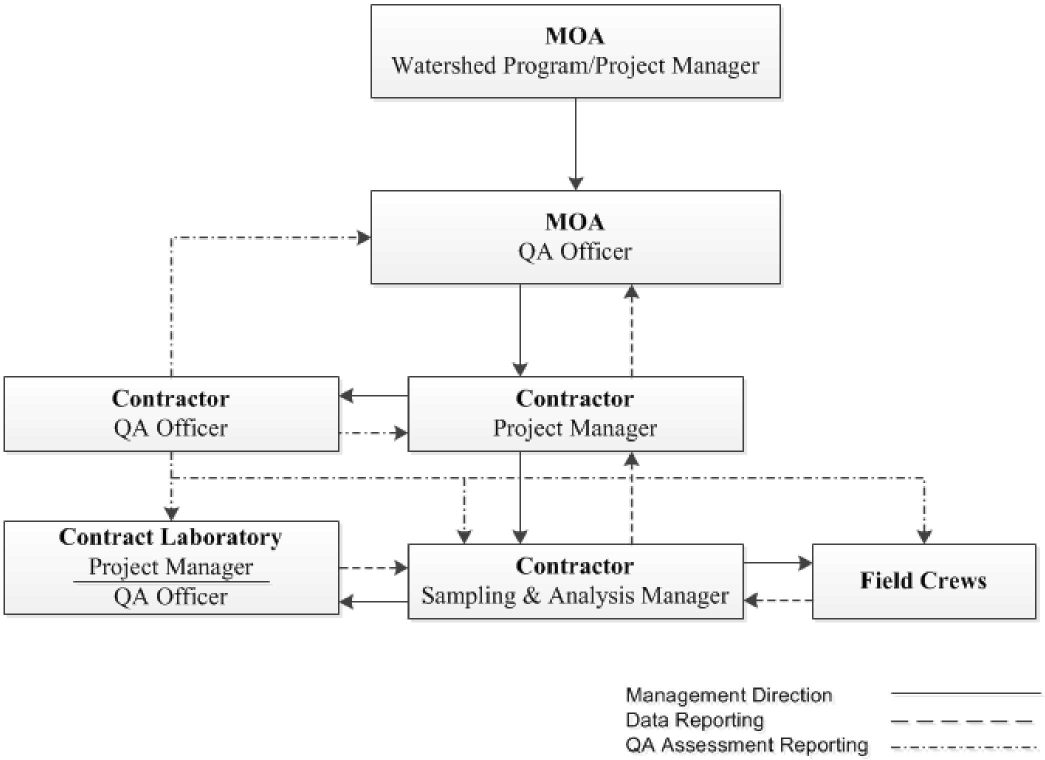
---

[1] The ADEC laboratory certification requirements are available at https://dec.alaska.gov/eh/lab/.

[2] The State of Washington Department of Ecology laboratory accreditation requirements are available at https://ecology.wa.gov/Regulations-Permits/Permits-certifications/Laboratory-Accreditation.

Project and task organization is shown in Figure 1.

Figure 1. Project/Task Organization



A.5 Problem Definition/Background and Project Objectives

Urban stormwater can contribute to the degradation of the quality of water bodies. Runoff from precipitation and snowmelt events can transport contaminants from impervious surfaces, such as driveways, sidewalks, and roads and semi-pervious surfaces, such as lawns, into the local water bodies. Most stormwater runoff flows into a storm sewer system or directly to a water body, often without receiving treatment to remove the pollutants.

The EPA has recognized urban stormwater as a major contributor to pollution of the nation's streams, rivers, and lakes. EPA and delegated states are using the National Pollutant Discharge Elimination System (NPDES) MS4 permit program to control pollutants from urban stormwater to the maximum extent practicable. EPA re-issued the MS4 permit in 2009 to co-permittees: the MOA and the Alaska Department of Transportation and Public Facilities. Figure 2 depicts the area regulated by the MS4 permit. The MOA has taken the lead role in implementing the monitoring requirements of the permit. Since permit issuance, EPA has delegated the NPDES stormwater program to the ADEC who now oversees its implementation. The permit is administered by ADEC as an APDES permit. The ADEC re-issued the MS4 permit with revisions, effective August 1, 2020.

The APDES MS4 permit establishes minimum control measures requiring the co-permittees to develop programs and policies, and implement actions designed to prevent and control contaminants entering publicly owned storm sewer systems.

Municipality of Anchorage
Watershed Management Services

FIGURE 2
Municipality of Anchorage Watersheds

Watershed Boundary
Lakes
Streams
Highway
Major road
Railroad
Municipality of Anchorage
🟩 Park

N

0 2 4
Miles

Date: June 07, 2011
Source data: HDR, MOA.
Projection: AK State Plane
Zone 4, NAD 83 ft.
File: Fig2_MOAWatersheds_11x17.mxd
Author: HDR Alaska, Inc.

This page intentionally left blank.

A number of water bodies in the greater Anchorage watershed have been categorized as impaired under Section 303(d) of the Clean Water Act. As of January 2021, 11 water bodies in Anchorage are listed as Category 4a in the State of Alaska's most recent Integrated Report. All water bodies are listed due to exceedance of the fecal coliform bacteria water quality standard. These water bodies are:

- Campbell Creek
- Campbell Lake
- Chester Creek
- Fish Creek
- Furrow Creek
- Little Campbell Creek
- Little Rabbit Creek
- Little Survival Creek
- Ship Creek – Glenn Hwy. Bridge down to mouth
- University Lake
- Westchester Lagoon

For these water bodies, ADEC has developed (and EPA has approved) Total Maximum Daily Loads (TMDL) plans to improve water quality to the extent that the waters will meet the current standards. The TMDLs identify stormwater runoff as a contributor of fecal coliform contamination to the water bodies; and the TMDLs establish reduction goals for concentrations of this pollutant in stormwater.

The monitoring elements of the MS4 permit are designed to identify sources of stormwater pollution, such as fecal coliform and petroleum hydrocarbons, monitor the effectiveness of best management practices (BMPs), and monitor the status of stormwater outfalls and receiving waters. The permit describes six specific monitoring projects.

The main body of this QAP describes common elements across the six monitoring projects and provides direction and QA/QC procedures for all the monitoring projects. Detailed, project-specific monitoring plans for the monitoring projects are provided in the following appendices to this QAP:

- Pesticide Screening Monitoring Plan – Appendix A
- Stormwater Outfall Monitoring Plan – Appendix B
- Snow Storage Site Retrofit Monitoring Plan – Appendix C
- Low Impact Development Pilot Project Monitoring Plan – Appendix D
- Dry Weather Screening Monitoring Plan – Appendix E
- Street Sweeping Monitoring Plan – Appendix H

A.6 Project/Task Description and Schedules

Each monitoring plan provided in the appendices includes descriptions of the specific tasks to be implemented to meet the objectives of the permit, and the associated schedules.

A.7 Quality Objective and Criteria for Measurement of Data

Data Quality Objectives (DQOs) for this program have been established to ensure that the data acquired meet the goals described in each of the monitoring plans, including identifying illicit discharges by water quality screening, determining structural controls' effectiveness, and detecting changes and trends in stormwater quality. In preparing the NPDES permit, EPA identified the following monitoring objectives in the NPDES MS4 Fact Sheet:

- Assess compliance with this permit;
- Measure the effectiveness of the permittee's stormwater management program;
- Measure the chemical, physical, and biological impacts to the receiving waters resulting from storm water discharges;

- Characterize storm water discharges;
- Identify sources of specific pollutants; and
- Detect and eliminate illicit discharges and illegal connections to the MS4.

Stormwater monitoring is designed to provide a feedback loop for the permittees to improve the stormwater management program and BMPs, rather than to assess compliance with effluent limits or water quality standards.

Measurement Quality Objectives (MQOs) are a subset of DQOs and are derived from the monitoring project's DQOs. MQOs are designed to evaluate and control various phases (sampling, preparation, and analysis) of the measurement process to ensure that total measurement uncertainty is within the range prescribed by the project's DQOs. MQOs are defined in terms of the following data quality indicators: detectability, precision, accuracy, completeness, representativeness, and comparability. Tables 2 through 4 define the objectives of detectability, precision, and accuracy for each parameter tested by the methods and field probes MOA anticipates using. For all monitoring plans, the sampling matrix is water. Table 5 provides similar information for precipitation and discharge monitoring methods. MQOs for detectability, precision, accuracy, representativeness, comparability, and completeness are discussed below.

Project DQOs may be revised in the future if the MOA Project Manager determines that different objectives would be more effective in meeting program goals. Any changes in DQOs will require this QAP to be revised and submitted to ADEC for approval prior to implementation.

A.7.1 Detectability

Detectability is the ability of an analytical method to reliably measure a pollutant concentration above background concentrations. Two components define detectability: the Method Detection Limit (MDL) and the Practical Quantification Limit (PQL), also known as the Reporting Limit (RL).

- The MDL is the minimum value at which the instrument can discern presence of the parameter apart from background noise, without certainty as to the accuracy of the measured value. For field measurements, the manufacturer's listed instrument detection limit is used.
- The PQL or RL is the minimum value that can be reported with confidence (usually a multiple of the MDL).

Sample data measured below the MDL will be reported as a non-detected value (ND). A sample measured above the MDL but below the PQL will be reported as the value with an estimated qualification flag. Results reported above the PQL will be reported as reliable, unless otherwise qualified based on the specific sample analyses.

Table 2. Measurement Quality Objectives for Field Instruments

Parameter	Method/Range	Sensitivity (MDL)	PQL	Precision	Accuracy	Calibration Method
pH	EPA 150.2 YSI 556 hand-held or equivalent 0-14 pH units	0.01 units	NA	± 0.2 units	± 0.2 units	Standard solutions: pH 4, 7, and 10
pH	EPA 150.2 Hach® Pocket Pro 0-14 units	0.1 units	NA	± 0.1 units	± 0.1 units	Standard solutions: pH 4, 7, and 10
Turbidity	EPA 180.1 Rev 2.0 M Hach® 2100P Turbidimeter 0 – 1,000 NTU	0.01 for 0 - 9.99 NTU for 1 - 10 NTU 1 for 100 -1000 NTU	NA	±1 NTU	± 2% 0-500 NTU ±3% 500-1000 NTU	Primary standards: 0, 20, 100, 800 NTU (Hach® method 8195)
Turbidity	EPA 180.1 Rev 2.0 M YSI 600 OMS V2 data logger 0 – 1,000 NTU	0.1 NTU	NA	±1 NTU	± 2% or 0.3 NTU, whichever is greater	Standard solutions: 0, 12.7, 126, and 1,000 NTU
Conductance	EPA 120.1 YSI 556 hand-held probe or equivalent 0.001 - 200 mS/cm	0.001 – 0.1 mS/cm range dependent	NA	± 0.001	± 5% of reading or 0.001 mS/cm, whichever is greater	Standard solution 3-point calibration (0 – 100, 100 – 1000, > 1000 µS/cm)
Conductance	EPA 120.1 YSI 600 OMS V2 data logger 0.001 - 200 uS/cm	0.001 – 0.1 mS/cm range dependent	NA	± 0.001	± 5% of reading or 0.001 mS/cm, whichever is greater	Standard solution 3-point calibration (0 – 100, 100 – 1000, > 1000 µS/cm)
Temperature	SM 2550 B YSI 556 hand-held probe or equivalent -5 – 45 °C	0.01 °C	NA	0.2 °C	± 0.15 °C	Comparison with a NIST-certified thermometer [a] at 0 °C and 20 °C
Temperature	SM 2550 B Hach® Pocket Pro or equivalent 0–50 °C	0.1 °C	NA	0.1 °C	1°C	Comparison with a NIST-certified thermometer [a] at 0 °C and 20 °C
Temperature	SM 2550 B YSI 600 OMS V2 data logger -5–70 °C	0.01 °C	NA	0.4 °C	± 0.15 °C	Comparison with a NIST-certified thermometer [a] at 0 °C and 20 °C
Dissolved Oxygen (DO)	EPA 360.1 YSI 556 hand-held probe or equivalent 0 - 50 mg/L	0.01 mg/L	NA	± 10%	± 0.2 mg/L	100% air saturation (refer to YSI 556 Manual)

[a] National Institute of Standards and Technology (NIST)-certified thermometer will have a greater resolution than the probe it will be used to calibrate

NA = not applicable; M = Modified per manufactures' recommendations; NTU = nephelometric turbidity units; mS/cm = millisiemens per centimeter; µS/cm = microsiemens per centimeter; SM = Standard Method; °C = degrees Celsius; mg/L = milligrams per liter

Table 3. Measurement Quality Objectives for Illicit Discharge Screening (Field Test Kits)

Parameter	Method/Range	Sensitivity (MDL)	PQL	Precision	Accuracy	Calibration Method
Total Chlorine	Hach® Method 8167[a], DPD/Color Disc, SM 4500-Cl G 0.1 – 3.4 mg/L	0.1 mg/L	NA	± 30%	± 0.5 mg/L	NA
Total Copper	Hach® Methods 8506 and 8026[a], Bicinchoninate/Color Disc, SM 3500-Cu C or E 0.1-4.0 mg/L	0.1 mg/L	NA	± 30%	± 0.5 mg/L	NA
Detergents	Hach® model DE-2 Toluidine blue -O chloroform colorimetric (Analytical Chemistry #38-791) 0.05 – 1.2 mg/L	0.05 mg/L	NA	± 30%	± 0.5 mg/L	NA
Total Phenols	Hach® Method 8047[a]: 4-Aminoantipyrine/Color Disc, EPA method 420.1 0.1 – 5 mg/L	0.1 mg/L	NA	± 30%	±0.5 mg/L	NA

SM = Standard Method; mg/L = milligrams per liter; NA = not applicable

Table 4. Measurement Quality Objectives for Laboratory Methods

Parameter	Method	Sensitivity (LOD)	PQL	Precision	Accuracy	Calibration Method
Fecal Coliform	SM 21 9222D	1 cfu/100 mL	1 cfu/100 mL	60 RPD	NA	Control checks for sterility and temperature
Chloride	EPA 300.0 Rev 2.1	0.031 mg/L	0.10 mg/L	20 RPD	90-110%	5-point curve
Total Copper	EPA 200.8 Rev 5.4	0.31 µg/L	0.1 µg/L	20 RPD	70-130%	5-point curve
Dissolved Copper	EPA 200.8 Rev 5.4	0.31 µg/L	0.1 µg/L	20 RPD	70-130%	5-point curve
Hardness	SM 21 2340B	5.0 mg/L	1.0 mg/L	20 RPD	85-115%	5-point curve
Biochemical Oxygen Demand (BOD)	SM 21 5210 B	2 mg/L	2 mg/L	NA	84-115%	Dissolved oxygen meter calibration
Total Suspended Solids (TSS)	SM 21 2540D	1 mg/l[a]	2 mg/l	25 RPD	75-125%	Standard balance calibration
2,4-D	EPA 515.4	1 µg/L	5 µg/L	30 RPD	70-130%	6-point curve
Carbaryl	EPA 531.2	2 µg/L	10 µg/L	30 RPD	65-135%	6-point curve
Total Organic Carbon	SM 5310B					
Specific Gravity	ASTM D854					

Parameter	Method	Sensitivity (LOD)	PQL	Precision	Accuracy	Calibration Method
Passive Collection Device	EPA 8260/8270		0.02 µg/L	25 RPD	< 10% RSD	5-point external
Total Petroleum Hydrocarbons (TPH)		0.006 µg/L				
BTEX						
Benzene		0.003 µg/L				
Toluene		0.003 µg/L				
Ethylbenzene		0.007 µg/L				
m-, p-xylene		0.007 µg/L				
o-xylene		0.003 µg/L				
Diesel Range Alkanes						
Undecane		0.003 µg/L				
Tridecane		0.003 µg/L				
Pentadecane		0.003 µg/L				
Trimethylbenzene						
1,3,5-trimethylbenzene		0.007 µg/L				
1,2,4-trimethylebenzene		0.003 µg/L				
Polycyclic Aromatic Hydrocarbons (PAH)						
Naphthalene		0.003 µg/L				
2-methyl naphthalene		0.003 µg/L				
acenaphthene		0.01 µg/L				
acenaphthylene		0.02 µg/L				
fluorene		0.01 µg/L				
phenanthrene		0.02 µg/L				
anthracene		0.02 µg/L				
fluoranthene		0.02 µg/L				
pyrene		0.02 µg/L				
Methyl t-butyl ether		0.021 µg/L				

Parameter	Method	Sensitivity (LOD)	PQL	Precision	Accuracy	Calibration Method
octane		0.007 µg/L				
Total Aromatic Hydrocarbons (TAH)						
Benzene	EPA 624	0.2 µg/L	0.2 µg/L	20 RPD	80-120%	Internal standard analysis
Toluene		0.0.5 µg/L	1 µg/L	20 RPD	77-120%	Internal standard analysis
Ethylbenzene		0.5 µg/L	1 µg/L	20 RPD	80-120%	Internal standard analysis
p & m Xylene		1 µg/L	2 µg/L	20 RPD	80-120%	Internal standard analysis
o-Xylene		0.5 µg/L	1 µg/L	20 RPD	80-120%	Internal standard analysis
Total Aqueous Hydrocarbons (TAqH)						
Acenaphthylene	EPA 625	0.025 µg/L	0.05 µg/L	30 RPD	58-105%	Internal standard analysis
Acenaphthene		0.025 µg/L	0.05 µg/L	30 RPD	57-110%	Internal standard analysis
Fluorene		0.024 µg/L	0.048µg/L	30 RPD	59-120%	Internal standard analysis
Phenanthrene		0.024 µg/L	0.048 µg/L	30 RPD	60-115%	Internal standard analysis
Anthracene		0.024 µg/L	0.048 µg/L	30 RPD	63-120%	Internal standard analysis
Fluoranthene		0.024 µg/L	0.048µg/L	30 RPD	63-125%	Internal standard analysis
Pyrene		0.024 µg/L	0.048 µg/L	30 RPD	62-130%	Internal standard analysis
Benzo(a)anthracene		0.024 µg/L	0.048 µg/L	30 RPD	61-120%	Internal standard analysis
Chrysene		0.0024 µg/L	0.048 µg/L	30 RPD	71-120%	Internal standard analysis
Benzo(b) fluoranthene		0.024 µg/L	0.048 µg/L	30 RPD	66-130%	Internal standard analysis
Benzo(k)fluoranthene		0.024 µg/L	0.048 µg/L	30 RPD	67-120%	Internal standard analysis
Benzo(a)pyrene		0.024 µg/L	0.048 µg/L	30 RPD	57-120%	Internal standard analysis
Indeno(1,2,3-cd) pyrene		0.024 µg/L	0.048 µg/L	30 RPD	59-125%	Internal standard analysis
Dibenzo (a,h) anthracene		0.024 µg/L	0.048 µg/L	30 RPD	56-125%	Internal standard analysis
Benzo(g,h,i)perylene		0.024 µg/L	0.048 µg/L	30 RPD	60-125%	Internal standard analysis
Naphthalene		0.048 µg/L	0.96 µg/L	30 RPD	56-108%	Internal standard analysis

LOD = level of detection; SM = Standard Method; cfu = colony forming units; mL = milliliters; RPD = relative percent difference; NA = not applicable; mg/L = milligrams per liter; µg/L = micrograms per liter; ASTM = American Society for Testing and Materials

Table 5. Measurement Quality Objectives for Precipitation and Discharge Monitoring Methods

Parameter	Method/Range	Sensitivity	PQL	Precision	Accuracy	Calibration Method
Precipitation	Tipping Bucket Model TB3/Minilog digital data logger 0-700 mm/hr	1 tip	NA	0.2 mm/0.01 in	± 2% for intensities from 25 to 500 mm/hr	Factory calibration
Discharge	V-notch weir with 45, 60, 120 degree notches/0.02-2 cfs	0.01 inch stage height	NA	0.01 in	± 3%	Factory calibration and field calibration at deployment
	Volumetric Method [a]	NA [b]	NA [b]	[b]	[b]	Factory calibration of bucket and stopwatch
	KPSI 720 with Hobo U30 data logger	0.00001 psi	NA	0.00001 psi	± 0.25% at full scale	Factory calibration
	YSI 600 OMS V2	0.001 ft	NA	0.001 ft	± 0.06ft	Factory calibration
	Hach® FH950 – Portable Velocity Meter 0 to 20 ft/s	0.01 ft	NA	0.01 ft	± 2% of reading ±0.05 ft for 0 to 10 ft/s; ±4% of reading from 10 to 16 ft/s	Factory calibration

[a] For small flows that can be concentrated into a single calibrated container

[b] Per USGS WSP 2175 because the measurement is taken 3 to 4 times the results are consistent and have no errors

NA = not applicable; mm = millimeters; cfs = cubic feet per second; psi = pounds per square inch; ft/s = feet per second

A.7.2 Precision

Precision is the degree of agreement among repeated measurements of the same parameter and gives information about the consistency of methods. It applies to all analytical techniques and field replicates. Precision is expressed in terms of the relative percent difference (RPD) between two measurements (A and B).

For field measurements, precision is assessed by measuring replicate (paired) samples at the same locations as soon as possible to limit temporal variance in sample results. Field and laboratory precision are measured by collecting blind (to the laboratory) duplicate samples. For paired and small data sets, project precision is calculated using the following formula:

$$RPD = \frac{(A - B) \times 100}{(A + B)/2}$$

For larger sets of paired precision data (e.g., overall project precision) or multiple replicate precision data, the following formula for relative standard deviation (RSD) is used:

$$RSD = \frac{standard\ deviation}{mean} \times 100$$

Duplicate samples will be taken a described in Section B.5. Goals for precision are described for each element of the monitoring effort in Tables 2 through 4.

A.7.3 Accuracy (Bias)

Accuracy (bias) is a measure of confidence that describes how close a measurement is to its “true value.” Methods to determine and assess accuracy of field and laboratory measurements include: instrument calibrations, various types of QC checks (e.g., sample split measurements, sample spike recoveries, matrix spike duplicates, continuing calibration verification checks, internal standards, field and laboratory blanks, external standards), and performance audit samples. Accuracy is usually assessed using the following formula:

$$Accuracy = \frac{Measured\ value}{True\ value} \times 100$$

Accuracy will be estimated by re-analyzing a sample to which a material of known concentration or amount of pollutant has been added, and results will be expressed as percent recovery. Matrix spikes and matrix spike duplicates will be collected for this purpose. Accuracy DQOs are provided in Tables 2 through 4.

A.7.4 Representativeness

Representativeness is the extent to which measurements actually represent the true environmental condition. Representativeness will not be routinely monitored throughout the monitoring projects, but is incorporated as data are interpreted. Representativeness is particularly difficult to achieve for stormwater quality as it changes depending on the storm size, phase of the storm, antecedent conditions, land use, and the amount of impermeable surface contributing to the discharge. Routine sampling over multiple seasons as well as flow proportional composite sampling can aid in understanding the variation associated with a particular outfall or subbasin. Sample locations, dates, times, sampling frequency, and environmental conditions will be selected for each of the monitoring projects to provide a framework for evaluating the representativeness of the data and meet the permit requirements.

A.7.5 Comparability

Comparability is the degree to which data can be compared directly to similar studies. Standardized sampling techniques, standard analytical methods, and units of reporting with comparable sensitivity will be used to ensure comparability. The MOA has selected EPA-approved field and analytical methods from *Standard Methods for the Examination of Water and Wastewater* and other EPA-approved methods. All field crew members will be trained to follow the standard protocols for each parameter as described in this QAP and the appended monitoring plans prior to conducting field work. Where possible, efforts to replicate conditions in previous studies have been made.

A.7.6 Completeness

Completeness is the comparison between the amount of useable data collected and the amount of data identified in the monitoring plans. Completeness is measured as the percentage of total samples collected and analyzed as a whole and for individual parameters and sites as compared to the goals established in the monitoring plans. Completeness will be measured as a percentage of useable samples of the total number of planned samples.

$$Completeness = \frac{No.\,planned\ samples - No.\,unacceptable/incomplete\ samples}{No.\,planned\ samples} \times 100$$

A completeness goal of 90% is established for hand-held field instruments, illicit discharge screening parameters, and for laboratory analyses. The laboratory will achieve 90% acceptable chemical and biological data under the QC conditions described in this QAP. However, holding time limitations for fecal coliform may have an effect on this completeness goal.

A.8 Training Requirements

A.8.1 Routine Monitoring

Training will be conducted by the Contract Project Manager, Contract QA Officer, Contract Sampling and Analysis Manager, the MOA QA Officer, and/or the laboratory staff depending on the type of training. The Contract QA Officer will ensure that field crews have or receive training on the following topics:

- General field safety
- Traffic safety
- Boat operation and safety (for pesticide screening field crew)
- Map reading
- Proper recording of data in field logbooks or data sheets including records of visual observations
- Flow measurements and data logger flow calibration

The Contract QA Officer, the Contract Sampling and Analysis Manager, the laboratory staff, and/or the MOA QA Officer will provide training on the following topics:

- Sampling protocols
- Field quality control samples
- Sample preservation and packaging
- Holding times
- Chain of custody (CoC) completion and procedures
- Laboratory location

This training will include the pre-field checks for the proper number and types of bottles, proper handling and maintenance of sample bottles, field sample preservation, proper packing, and completion of the CoC forms.

As appropriate for the type of monitoring being conducted, field crew members will receive training in the use and calibration of the YSI 556 and Hach® 2100P hand-held probes including procedures for calibration and measurement of pH, dissolved oxygen (DO), specific conductance, temperature, and turbidity. Field crews conducting the dry weather screening will have or receive training in monitoring, recording and reporting for data collected with the total phenols, detergents, total copper and total chlorine field test kits. Trainers will include those people listed above who are senior technical experts with no fewer than 100 hours of field experience performing water quality sampling.

A.8.2 Automated Probes Monitoring

Prior to entry into the field, training on both deployment, set up, and disassembly of all automated monitoring equipment and data loggers will be required for all field staff associated with projects requiring these specialized pieces of equipment. Training will be provided in the following areas:

- Tipping bucket rain gages
- Installation and use of pressure transducers
- Installation and use of temporary weirs
- Flow monitoring data loggers
- Automated probes that monitor temperature, specific conductance, pH, DO, temperature, and/or turbidity, such as the YSI 600 OMS V2 or equivalent

Equipment training may be offered by the equipment manufacturer, the rental company, or a senior technical expert who has at least 100 hours of field experience with the specific piece of equipment. Training will include operation and calibration of all hand-held and automated probes, and downloading data collected from these pieces of equipment.

A.9 Documentation and Records

All data gathered in the field will be recorded on-site in waterproof field logbooks or datasheets at the time of sampling. Each monitoring project will have a separate field logbook that will be used throughout the duration of the monitoring project. Field crews will record instrument calibration data in the field logbooks, as well as other specific observations identified in each of the monitoring plans. Field logbooks and datasheets will become part of the record maintained by MOA. Recordings from the field instruments (i.e., pH, specific conductance, DO, temperature, and turbidity) and records of field test kit results will be made in the field logbooks or datasheets, then transferred to the database or spreadsheet for the specific monitoring project. A unique data file name will be assigned to each file based on the monitoring project. The QA review process for field data is described in Section B.10, Data Management.

For data gathered via data logger, automated probe, or automated sampler, all data will be saved as raw data files before QA is performed. For each set of data gathered from these instruments, a unique data file name will be created each time the instrument is deployed and will include a root identifier specific to the monitoring project. In addition to a project identifier that will link field data with automated data, the file name will contain the location and the date of deployment. Upon retrieval of the instrument, the data will be downloaded and saved as an Excel file. The QA review process is described in Section B.10, Data Management, and outlines how all data will be saved in the appropriate format and with the appropriate file names for easy retrieval.

Laboratory results associated with each of the monitoring projects will also be maintained electronically. The laboratory will provide results electronically in a format specified by the MOA. The laboratory data QA review process is described in Section B.10 and outlines how all data will be saved in the appropriate format and with the appropriate file names with a file identifier that links it to the specific monitoring project for easy retrieval.

MOA will maintain records of all electronic data and field logbooks for a minimum of five years. Table 6 provides a list of the records and locations of their storage.

Table 6. Project Documents and Records

Category	Record/Document Type	Location
Site Information	Site maps in specific monitoring report	WMS
	Site photographs in specific monitoring report	WMS
Environmental Data Operations	QAP	WMS
	Field SOPs – Appended to QAP	WMS
	Field logbooks and/or datasheets including sample handling, field observations, and field instrument calibration	WMS
	CoC forms	WMS
	Equipment inspection and maintenance records	WMS
Data Reporting	Monitoring reports	WMS
	Project summary reports	WMS
	Laboratory analysis reports	Contract Laboratory
Data Management	Data algorithms appended to specific monitoring reports	WMS
	Water quality data (field and laboratory results) in spreadsheets	WMS
	Flow and automatic field water quality electronic data	WMA
Quality Assurance	Field inspection reports	WMS
	Laboratory control charts	Contract Laboratory
	Performance evaluation samples	Contract Laboratory
	Laboratory audits	Contract Laboratory
	Laboratory QA reports/corrective action reports	Contract Laboratory
	Field equipment and field inspection reports/corrective action reports and response	WMS

SOPs = Standard Operating Procedures

B. Data Generation and Acquisition

B.1 Sampling Process Design

The sampling design for each of the monitoring projects including monitoring objectives, sample locations, parameters, sampling frequencies, and site-specific procedures are described in the monitoring plans included as the following appendices:

- Pesticide Screening Monitoring Plan – Appendix A
- Stormwater Outfall Monitoring Plan – Appendix B
- Snow Storage Site Retrofit Monitoring Plan – Appendix C
- Low Impact Development Pilot Project Monitoring Plan – Appendix D
- Dry Weather Screening Monitoring Plan – Appendix E
- Street Sweeping Monitoring Plan – Appendix H

B.2 Sampling Methods Requirements

B.2.1 Sample Types

Grab samples or flow-weighted composite samples will be obtained depending on the monitoring project. Continuous monitoring of some parameters will also be obtained. Sample types are discussed in each of the monitoring plans in the appendices.

B.2.2 Sample Containers and Equipment

All sampling equipment and sample containers will be cleaned according to the equipment specifications and/or the contract laboratory. Bottles supplied by the laboratory for sample analysis will be pre-cleaned. These will only be used for samples and will not be pre-rinsed. Sample equipment will be pre-cleaned and cleaned between sample locations as specified in Appendix F – Standard Operating Procedures.

Samples collected in the field for laboratory analysis will be collected as described in Section B.3.2 and the standard operating procedures (SOPs) in Appendix F, labeled as described in Section B.3.4, and will be packed into insulated ice chests with either gel ice (freezable gel packs) or crushed ice that is double-bagged in zip-locked plastic bag. Samples will be maintained at temperatures listed in Table 7 (plus or minus 2 °C) until delivered to the laboratory. Temperature in transit will be monitored with a temperature blank provided by the laboratory. A CoC form will be completed by the field personnel for each packed ice chest, will be placed in a plastic zip-locked bag, and placed in the ice chest. All samples will be in the control of the field crew until they are delivered to the laboratory, at which time the CoC form will be signed by the laboratory personnel indicating that they have assumed custodial responsibility. In the event that full sample coolers are removed from the direct control of the sampling team without being transferred to the laboratory, custody seals will be placed on the cooler from lid to base and taped in place with clear packing tape.

For samples that will be analyzed by the laboratory, the bottle requirements, sample volumes, preservatives, and holding times are described in Table 7. Because some of these samples will be obtained in the afternoon or outside of normal business hours, special arrangements may need to be made to ensure that the laboratory is still able to process the samples within the specified holding times.

Table 7. Containers, Volumes, Preservation Methods, and Holding Times for Laboratory Analyzed Parameters

Parameter	Matrix	Container Type	Volume Required	Preservation	Holding Time
Biochemical Oxygen Demand (BOD)	Stormwater	HDPE	1 L	Cool to ≤ 6 °C, keep in the dark, lab temp receipt must be recorded to 2 significant figures	48 hours
Total Suspended Solids (TSS)	Stormwater	HDPE	1 L	Cool to ≤ 4 °C	7 days
Fecal Coliform	Stormwater	HDPE	125 mL sterile bottle	Cool to < 10 °C, do not freeze	< 6 hours to lab; < 2 hours from lab receipt to sample prep; Not additive
Total Copper	Stormwater	HDPE	250 mL	HNO_3 to pH < 2	6 months
2,4-D	Surface water	Amber glass	2 - 1 L	Sodium sulfite Cool to ≤ 6 °C, do not freeze	14 days until extraction, 40 days after extraction
Carbaryl	Surface water	Amber glass	2 - 1 L	Potassium citrate, monobasic Cool to ≤ 4 °C, do not freeze,	7 days until extraction, 40 days after extraction
Chloride	Stormwater	HDPE	500 mL	NA	28 days
Total Aromatic Hydrocarbons (TAH)	Stormwater	Glass, Teflon lined septum	3-40 mL vials, sample filled to meniscus	HCl pH < 2, Cool to ≤ 6 °C, do not freeze, (0.0008% $Na_2S_2O_3$)[a]	14 days
Total Aqueous Hydrocarbons (TAqH)	Stormwater	Amber glass, Teflon-lined cap	2 - 1 L	Cool to ≤ 6 °C, (0.0008% $Na_2S_2O_3$)[a], do not freeze, store in dark	7 days until extraction, 40 days after extraction

[a] Sodium thiosulfate required only if sample contains chlorine
HDPE = high density polyethylene; L = liter; °C = degrees Celsius; ml = milliliters; NA = not applicable

B.2.3 Sampling Methods

Sampling methods are described in specific monitoring plans (Appendices A through E and H), Appendix F – Standard Operating Procedures, and Section B.3.

B.3 Sampling Handling and Custody Requirements

B.3.1 Sampling Event Preparation

The Contract Sampling and Analysis Manager is responsible for ensuring the following has been completed prior to a field crew entering the field:

- Written instructions have been prepared and provided to each of the field crew
- Each field crew member has received the appropriate training to enter the field
- Each field crew has necessary field equipment and bottles from the laboratory
- Each field crew member has completed an in-office review of the anticipated conditions and sampling protocols

The field monitoring probes will be calibrated on the day of the sampling event prior to entry into the field or in the field. Calibration procedures will be documented in the field logbook, including the expiration dates of the standards and the results from all calibration tests.

B.3.2 Sampling Procedures

Where stormwater grab samples will be collected from low flows for field parameters or laboratory analysis, the field crew will collect samples in accordance with the field sampling protocols described in Appendix F – Standard Operating Procedures. Field sample crews will collect an adequate volume of sample for all sample bottles, replicates, and field monitoring analyses.

Where samples are to be collected from flow over a temporary or permanent weir or where water is free falling from a pipe, sample bottles will be held under the flow. For samples collected directly in laboratory analysis bottles that contain preservative, field crew will apply care not to overtop the sample bottles.

Where a stream is being sampled, the field crew will face up-stream and obtain a sample by inverting the clean sampling bottle below the water surface, righting the bottle, and drawing the bottle up through the water column. If the water is shallow, the field crew will use a shallower grab to ensure that no sediments are entrained in the sample.

Sample bottles for total aromatic hydrocarbons (TAH) must not contain any air bubbles. This is accomplished by pouring the sample from the sample collection bottle into the 40 mL vial until there is a slight convex meniscus at the top of the bottle, placing and tightening the cap, and inverting the bottle to ensure no air bubbles are trapped. SOPs for sampling specific parameters are provided in Appendix F.

Field crew members will assign a unique sample number as described in Section B.3.3, label the bottles with indelible ink, add any preservative required (unless the laboratory has provided the preservative in the bottle already), prepare the CoC form, and pack the bottles as described in Section B.2.3.

The YSI 556 probe measurements will be collected from flowing water and probe measurements will be recorded in the field logbook.

B.3.3 Unique Sample Identification Numbers

Sample identification will include the site name, a separate line for the date, and another line for the sample time. These three fields combined will create a unique identifier for each sample. For example, A sample taken at C St Up Station for the Sedimentation Basin Study on August 30th, 2021 at 4 pm will be labeled as follows:

Site Name: CSTUP
Date: 8/30/2021
Time: 1600

When field duplicates are collected along with primary samples the word “DUP” will be attached to the end of the site name.

All sample names, dates, times, and duplicate sample information will be filled in on each sample label and logged in the field book or on the associated datasheet.

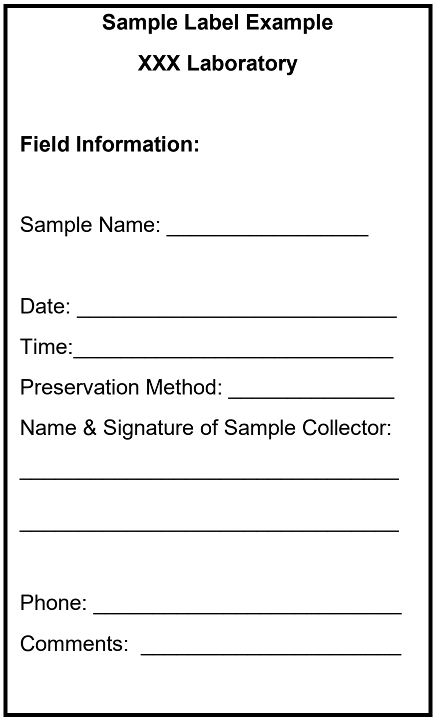
B.3.4 Sample Labels

Each sample transported to the laboratory will have a label with the following information on it in indelible ink:

- Site Name
- Date sample collected
- Time sample collected (recorded in 24-hour clock)
- Analyses required
- Preservation (if any)
- Initials of the field crew member who collected the sample

An example of a sample label is shown in Figure 3.

Figure 3. Example Sample Label



Sample Label Example

XXX Laboratory

Field Information:

Sample Name: ________________

Date: __________________________
Time:__________________________
Preservation Method: _____________
Name & Signature of Sample Collector:
____
____

Phone: _________________________
Comments: _____________________

B.3.5 Chain of Custody Forms

CoC forms provided by the contract laboratory will be used for samples submitted to the laboratory for analysis. An example CoC form is provided at the end of Appendix F – Standard Operating Procedures. The CoC form must contain the following information for each sample:

- Unique sample number
- Type of sample (e.g., water)
- Sample location
- Date and time sample collected (time recorded in 24-hour clock)
- Analyses required by analyte name and method number
- Printed name of person collecting sample

- Printed name and signature of person with responsibility for custody of samples until receipt by the laboratory
- Time and date received at laboratory
- Printed name and signature of laboratory staff with responsibility for ensuring custody of samples

The completed CoC forms will be scanned and returned to the MOA with the data package.

B.3.6 Field Logbook

In addition to the information itemized in each of the monitoring plans, field crew members will record the following information in the logbook at each sampling station:

- Weather conditions, time, date, and location of sample
- Unique sample identification numbers
- Other unusual conditions
- Photo numbers and explanation (e.g. upstream/downstream facing, control structure, water body, etc.)

Each page of the field logbooks will be numbered, signed, and dated by the sampling crew member who completed it. Where a page is left partially blank, a note should be made with a line through the clean portion of the page; and each page must be signed and dated.

B.3.7 Automated Multiprobes

The YSI 600 OMS V2 probes will be calibrated and calibration procedures recorded on calibration forms prior to deployment. The probes will be cleaned, recalibrated, redeployed, and documented on calibration forms on a consistent basis to prevent drift (approximately once every three weeks or more frequently if necessary). The calibrated probes will be programmed to begin sampling and recording at designated intervals of no less than 15 minutes throughout the storm or runoff event. Instruments will be placed in approximately mid-channel both vertically and horizontally in locations of moderate to slow velocity. Where instruments must remain submerged, a special device will be created to ensure continuous submersion.

Multiprobes and data loggers will be protected from vandalism.

A unique file name will be created each time a multiprobe is programmed and deployed with a route identifier unique to the monitoring project. The file name will contain the location and date of deployment. Upon retrieval, the data will be downloaded and saved as an Excel file using the unique file name.

CoC forms will not be used for data obtained from automated data logging probes.

B.3.8 Flow Monitoring

Where flow monitoring is conducted manually, the field crew will accurately measure and record the staff gage level to the nearest 0.01 inch.

When flow is recorded with data loggers, field crew will calibrate the data logger as described in the SOPs in Appendix F on a routine basis to ensure accuracy and record the calibration on the data logger maintenance data form. During a storm event when they are obtaining samples, field crew will manually read and record staff gage measurements (and time), and compare the value to those recorded by the data logger, as described in Appendix F.

B.4 Analytical Methods Requirements

Tables 2, 3, and 4 provide the analytical methods, precision and accuracy requirements that apply to the monitoring plans for all of the monitoring projects. The contract laboratory will be provided a copy of this QAP to ensure that they can meet the MQOs for detectability, precision, accuracy, comparability, and completeness prior to being awarded the contract. Once a laboratory has been selected by the Contract Project Manager, the laboratory Quality Management Plan (QMP) will be appended to this QAP. QMPs for all local laboratories that have been approved by ADEC under the Drinking Water Program are maintained on file at ADEC. Once selected, the contract laboratory will provide their approved QMP to the ADEC Division of Water (DOW) QA Officer, if it has not already been approved.

B.5 Quality Control Requirements

Quality control begins with training the field staff. As described in Section A.8, training will be conducted by the Contract Project Manager, the Contract QA Officer, the Contract Sampling and Analysis Manager, the MOA QA Officer, and/or the laboratory staff depending on the type of training required. The Contract QA Officer will ensure that field crews receive appropriate training for those facets of monitoring that they will conduct.

Quality control activities in the field will include adherence to documented SOPs, comprehensive documentation of sample collection information, and field instrument calibration data. A rigidly enforced CoC program will ensure sample integrity and identification. The CoC form will document the handling of each sample from the time the sample was collected until its arrival and acceptance at the laboratory.

Table 8 lists the types of field QC samples that will be collected for samples to be analyzed in the laboratory.

Field replicates provide a way to estimate the variability of individual results. If conditions in the stormwater change faster than the procedure is repeated, the precision calculated from duplicate samples will also include that variability. All field samples (kits and hand-held probes) and laboratory samples will be replicated at a rate of 15% or one per field day, whichever is greater.

Trip blanks are samples that are prepared in the laboratory and carried into the field to determine whether samples are exposed to contamination in transit from lab to field or field to lab, from sampling handling procedures, or from conditions in the field such as boat or vehicle exhaust.

Equipment rinse analyses (blanks) will be conducted for all parameters, except pH and temperature, for each sampling event where a sampling device is used to collect the sample. This type of analysis ensures that sample equipment is clean and uncontaminated. After decontaminating the sampling equipment, deionized water will be poured through the equipment and samples will be collected for analyses.

Matrix spike/matrix spike duplicate samples provide an estimate of laboratory accuracy and precision and will be gathered for the relevant laboratory parameters listed in Table 8.

Table 8. Frequency of QC Samples to be Collected in the Field

Parameter	Field Replicate (15% or 1/day, whichever is greater)	Trip Blank (1/day)	Equipment Rinse Blank (15% or 1/day, whichever is greater)	MS/MSD (15% or 1/day, whichever is greater)
Hand-Held Probes and Field Test Kit Methods				
pH	X			
Conductance	X			
Turbidity	X			
Temperature	X			
Total Chlorine	X		X	
Detergents	X		X	
Phenols	X		X	
Total Copper	X		X	
Laboratory Analyses				
Fecal Coliform	X			
Chloride	X		X	X
Total Copper	X			
Biochemical Oxygen Demand (BOD)	X			
Total Suspended Solids (TSS)	X			
2,4-D	X		X	X
Carbaryl	X		X	X
Total Aromatic Hydrocarbons (TAH)	X	X	X	X
Total Aqueous Hydrocarbons (TAqH)	X		X	X

MS/MSD = matrix spike/matrix spike duplicate

QC acceptance criteria for trip blanks and equipment rinse blanks are equal the PQLs defined in Table 4. Replicate QC acceptance criteria for field replication and matrix spike/matrix spike duplicates (MS/MSDs) are equal the precision and accuracy for the parameters defined in Tables 2 through 4.

Automated water quality instrument readings will be verified against calibrated hand-held probes for water quality parameters on a tri-weekly basis or more frequently if necessary. This level of replication will allow determination of whether the automated instruments are accurate, need recalibration, or if data should be adjusted for drift.

Discharge measurements using the bucket method will be performed in quadruplicate to assure precision and accuracy. Field discharge monitoring using weirs and data loggers will be checked either on a monthly basis or when sampling, downloading of data, or maintenance is occurring by comparing a visual reading of the staff gage against the data logger. This level of replication will allow determination of whether the equipment is accurate, needs recalibration (by adjusting the reference level), or if data should be adjusted for drift. Data loggers that do not meet the accuracy tests prior to deployment will be returned to the manufacturer. Comparison of visual or handheld instrument data sets will be appended to the monitoring report.

Laboratory QC sample frequencies and QC acceptance criteria are described in Tables 9 and 10. The laboratory will provide analytical results after verification and validation by the Laboratory QA Officer. The laboratory will provide all relevant QC information with its summary of data results for each analytical batch. The Contract QA Officer will perform a review of the laboratory results to ensure that the required QC measurement criteria have been met. If a QC concern is identified in the review process, the Contract Project Manager and Contract QA Officer will seek additional information from the laboratory to resolve the issue and take appropriate corrective action.

Table 9. Frequency of Laboratory QC Samples

Parameter	Method	Lab Blank	Lab Fortified Blank	Calibration Verification Check Standard	MS/MSD	External QC Check Standard	Surrogate Standard
Fecal Coliform	SM 9222D	1 per daily batch	NA	NA	NA	1 per daily batch	NA
Chloride	EPA 300.0 Rev 2.1	1 per batch of ≤ 20 samples	1 per batch of ≤ 20 samples	1 per 10 samples and at end of run	1 MS and 1 duplicate per 10 samples	1 per analytical batch or daily	NA
Total Copper	EPA 200.8 Rev 5.4	1 per batch of ≤ 20 samples	1 per batch of ≤ 20 samples	1 per 10 samples and at end of run	1 MS per 10 samples	After each calibration curve	NA
Biochemical Oxygen Demand (BOD)	SM 5210 B	3 per batch of ≤ 20 samples	3 per batch of ≤ 20 samples	NA	NA	NA	NA
Total Suspended Solids (TSS)	SM 2540D	1 per batch of ≤ 20 samples	NA	NA	1 duplicate per 10 samples	1 per batch of ≤ 20 samples	NA
2,4-D	EPA 515.4	1 per batch of ≤ 20 samples	NA	Beginning of each batch, after every 10 samples, and at end of batch	1 per batch of ≤ 20 samples	After each calibration curve	In each sample, prep QC sample, and instrument standard
Carbaryl	EPA 531.2	1 per batch of ≤ 20 samples	1 per batch of ≤ 20 samples	Beginning of each batch, after every 10 samples, and at end of batch	1 per batch of ≤ 20 samples	After each calibration curve	In each sample, prep QC sample, and instrument standard
Total Aromatic Hydrocarbons (TAH)							
Benzene	EPA 624	1 per batch of ≤ 20 samples	1 per batch of ≤ 20 samples	Beginning of each 12-hour tune period	1 per batch of ≤ 20 samples	After each calibration curve	In each sample, prep QC sample, and instrument standard
Toluene							
Chlorobenzene							
Ethylbenzene							
p & m-Xylene							
o-Xylene							

Parameter	Method	Lab Blank	Lab Fortified Blank	Calibration Verification Check Standard	MS/MSD	External QC Check Standard	Surrogate Standard
Total Aqueous Hydrocarbons (TAqH)							
Acenaphthylene	EPA 625	1 per batch of ≤ 20 samples	1 per batch of ≤ 20 samples	Beginning of each 12-hour tune period	1 per batch of ≤ 20 samples	After each calibration curve	In each sample, prep QC sample, and instrument standard
Acenaphthene							
Fluorene							
Phenanthrene							
Anthracene							
Fluoranthene							
Pyrene							
Benzo(a)anthracene							
Chrysene							
Benzo(b)fluoranthene							
Benzo(k)fluoranthene							
Benzo(a)pyrene							
Indeno(1,2,3-cd) pyrene							
Dibenzo (a,h) anthracene							
Benzo(g,h,i)perylene							
Naphthalene							

SM = Standard Method; NA = not applicable

Table 10. Laboratory QC Samples Acceptance Criteria

Parameter	Method	Lab Blank	Lab Fortified Blank	Calibration Verification Check Standard	MS/MSD	External QC Check Standard	Surrogate Standard
Fecal Coliform	SM 9222D	No growth	NA	NA	NA	Growth present	NA
Chloride	EPA 300.0 Rev 2.1	<PQL	±10%	±10%	MS = ±10% Dup. = RPD ≤ 20 or absolute difference < LOQ	±10%	NA
Total Copper	EPA 200.8 Rev 5.4	< PQL	±15%	±15%	70 – 130% if analyte concentrations are < 4 times the spike	±10%	NA
Biochemical Oxygen Demand (BOD)	SM 5210 B	Maximum depletion of ±0.2 mg/L	TV = 198 ±30.5 mg/L	NA	NA	NA	NA
Total Suspended Solids (TSS)	SM 2540D	< PQL	NA	NA	Dup. = RPD ≤ 25	75 – 125%	NA
2,4-D	EPA 515.4	< PQL	NA	70 – 130%	70 – 130%, RPD ≤ 30	70 – 130%	70 – 130%
Carbaryl	EPA 531.2	< PQL	70 – 130%	70 – 130%	70 – 130%, RPD ≤ 20	70 – 130%	70 – 130%
Total Aromatic Hydrocarbons (TAH)							
Benzene	EPA 624	< PQL	80 – 120%	RPD ≤ 20%	80 – 120%	80 – 120%	
Toluene			77 – 120%		77 – 120%		
Chlorobenzene			80 – 120%		80 – 120%		
Ethylbenzene			80 – 120%		80 – 120%		
m,p-Xylene			80 – 120%		80 – 120%		
o-Xylene			80 – 120%		80 – 120%		
1,2-Dichloroethane-d_4 (surr.)		NA	73 - 120%		73 - 120%		73 - 120%
Toluene-d_8 (surr.)		NA	80 - 120%		80 - 120%		80 - 120%
4-Bromofluorobenzene (surr.)		NA	76 – 120%		76 – 120%		76 – 120%

Parameter	**Method**	**Lab Blank**	**Lab Fortified Blank**	**Calibration Verification Check Standard**	**MS/MSD**	**External QC Check Standard**	**Surrogate Standard**
Total Aqueous Hydrocarbons (TAqH)							
Acenaphthylene	EPA 625	< PQL	53 - 105%	RPD ≤ 20%	53 - 105%	70 – 130%	
Acenaphthene			53 – 110%		53 – 110%		
Fluorene			56 - 110%		56 - 110%		
Phenanthrene			58 - 115%		58 - 115%		
Anthracene			59 - 110%		59 - 110%		
Fluoranthene			59 - 115%		59 - 115%		
Pyrene			62 - 128%		62 - 128%		
Benzo(a)anthracene			64 - 110%		64 - 110%		
Chrysene			63 – 110%		63 – 110%		
Benzo(b) fluoranthene			57 - 120%		57 - 120%		
Benzo(k)fluoranthene			58 - 124%		58 - 124%		
Benzo(a)pyrene			58 – 110%		58 – 110%		
Indeno(1,2,3-cd) pyrene			51 – 125%		51 – 125%		
Dibenzo (a,h) anthracene			53 - 125%		53 - 125%		
Benzo(g,h,i)perylene			48 - 123%		48 - 123%		
Naphthalene			45 - 100%		45 - 100%		
2-Fluorophenol (surr.)		NA	21 – 88%		21 – 88%		21 – 88%
Phenol-d6 (surr.)		NA	28 – 97%		28 – 97%		28 – 97%
Nitrobenzene-d5 (surr.)		NA	41 – 110%		41 – 110%		41 – 110%
2-Fluorobiphenyl (surr.)		NA	50 – 110%		50 – 110%		50 – 110%
2,4,6-Tribromophenol (surr.)		NA	45 – 124%		45 – 124%		45 – 124%
Terphenyl-d_{14}		NA	52 - 135%		52 - 135%		52 - 135%

SM = Standard Method; NA = not applicable; Dup. = duplicate; LOQ = limit of quantitation; surr. = surrogate

B.6 Instrument/Equipment Testing, Inspection, and Maintenance

The training described in Section A.8 includes expectations for proper field equipment handling and the inspection of field test kits, hand-held monitoring equipment, sampling equipment, and laboratory bottles prior to entering the field.

All equipment and field test kits will be checked upon receipt from the manufacturer by the Contract Sampling and Analysis Manager to ensure that equipment is properly operating and the kits are complete. Before a sampling event, the field crew will inspect all kits for completeness. Equipment that is not operating properly or cannot be calibrated will not be used in the field. Field equipment and test kits will also be inspected when the field crew returns from the field by the Contract Sampling and Analysis Manager.

Automated probes will be inspected prior to their deployment into the field. Instruments that fail to calibrate appropriately or fail to function will be sent to the manufacturer for repair. Data logged from the automatic instruments will be graphed when they are returned from the field, or in the field if possible, to detect erratic measurements. All instrument maintenance, testing, and storage will follow the manufacturer's recommendations.

B.7 Instrument Calibration and Frequency Procedures

Instrument calibration will follow the manufacturer's recommendation.

Hand-held water quality monitoring instruments will be calibrated daily before use. Tables 2 through 4 list the calibration standards for each type of hand-held and automated device. Calibration procedures for the YSI 556 or equivalent, YSI 600 OMS V-2, Hach® pH Pocket Pro or equivalent, and the Hach® 2100P are provided in Appendix G – Maintenance and Calibration of Equipment. A record of equipment calibration and calibration standards will be maintained in the field logbooks, which will be maintained for 5 years.

When the YSI 600 OMS V-2 is deployed, the water quality parameters it records will be checked against a hand-held YSI 556 and/or Hach 2100P turbidimeter on a tri-weekly basis or more frequently if necessary as described in Section B.5.

For those monitoring projects where precipitation will be recorded, a tipping bucket rain gage and data logger that records in 0.01-inch increments will be used. These instruments will be calibrated by the manufacturer prior to field deployment and require no additional calibration.

Weirs and installed staff gages will be calibrated at installation. The field crew will check calibration prior to a predicted storm event, during event grab sampling, and following the event.

B.8 Inspection and Acceptance Requirements for Supplies

Monitoring supplies such as sample bottles, preservatives, sample labels, ice, coolers, and CoC forms will be provided by the contract laboratory. Calibration solutions and deionized water, and other supplies will be maintained at the Contractor field office. The Contract Sampling and Analysis Manager is responsible for ordering supplies and equipment and ensuring adequate supplies are available for use at the time of sampling. It is also the responsibility of the Contract Sampling and Analysis Manager to ensure that the calibration chemicals and supplies have not passed their expiration date.

Automated multiprobes and data loggers will be checked for proper operation upon receipt from the manufacturer and prior to each deployment. Multiprobes will be calibrated prior to deployment. All equipment will be inspected upon retrieval from the sites. Any problems or concerns resulting from inspections will be documented and brought to the attention of the Contract Project Manager, and if necessary, to the MOA Project Manager.

B.9 Data Acquisition Requirements for Non-Direct Measurements

Weather data such as antecedent precipitation is readily available from the National Weather Service and the National Oceanic and Atmospheric Administration National Centers for Environmental Information.[3] These data are assumed to be accurate and usable.

B.10 Data Management

Data review and management are also part of the QC process. This section identifies three levels of QC review, and the data review process is depicted in Figure 4.

Field logbooks and/or data sheets will be used to record instrument calibration data, locations of the sampling station, date and time of sample collection, recorded measurements, deviations from the sampling protocols, and observations as described in each of the monitoring plans. Field staff will document records in waterproof ink or pencil. At the end of each day’s sampling event, the field logbooks will be reviewed and initialed by the Field Staff Lead for the project. Corrections will be made by drawing a single line through the corrected entry and will be initialed and dated.

Proper data management is necessary to effectively collect, display, and evaluate data. Data from filled logbooks and continuously recorded data will be compiled to produce discharge and water quality data. Field data (both manual and electronic) will be stored with spatial coordinates in a database that interfaces with a Geographic Information System (GIS) for management, storage, and analysis. Manual data refer to data that are recorded in the field logbooks. Electronic data include pressure transducer records, discharge meter measurements, Global Positioning System (GPS) files, continuously recording YSI meters, and tipping bucket rain gages. Data management includes processes that range from pre-field activities through compilation and export of data, including the following activities:

- Database file creation and organization
- Electronic scanning and organization of field logbooks
- Uploading raw manual field data into the project database
- Uploading, adjusting, and organizing flow and continuously recording water quality data
- Compiling and organizing GIS data
- Compiling surveyed gage elevations
- Periodic data exportation to WMS

The QC program for each monitoring project’s field data is designed to meet the DQOs at three levels. A QC Level I review includes a daily review of field logbooks to assure data integrity and completeness. This will be conducted by the Field Staff Lead, who will initial the logbooks at the end of each field day to document that QC Level I has been completed. Data transfers of electronically collected data (e.g., stream gage, YSI continuously recording meters, and GPS data) will also be reviewed and documented

---

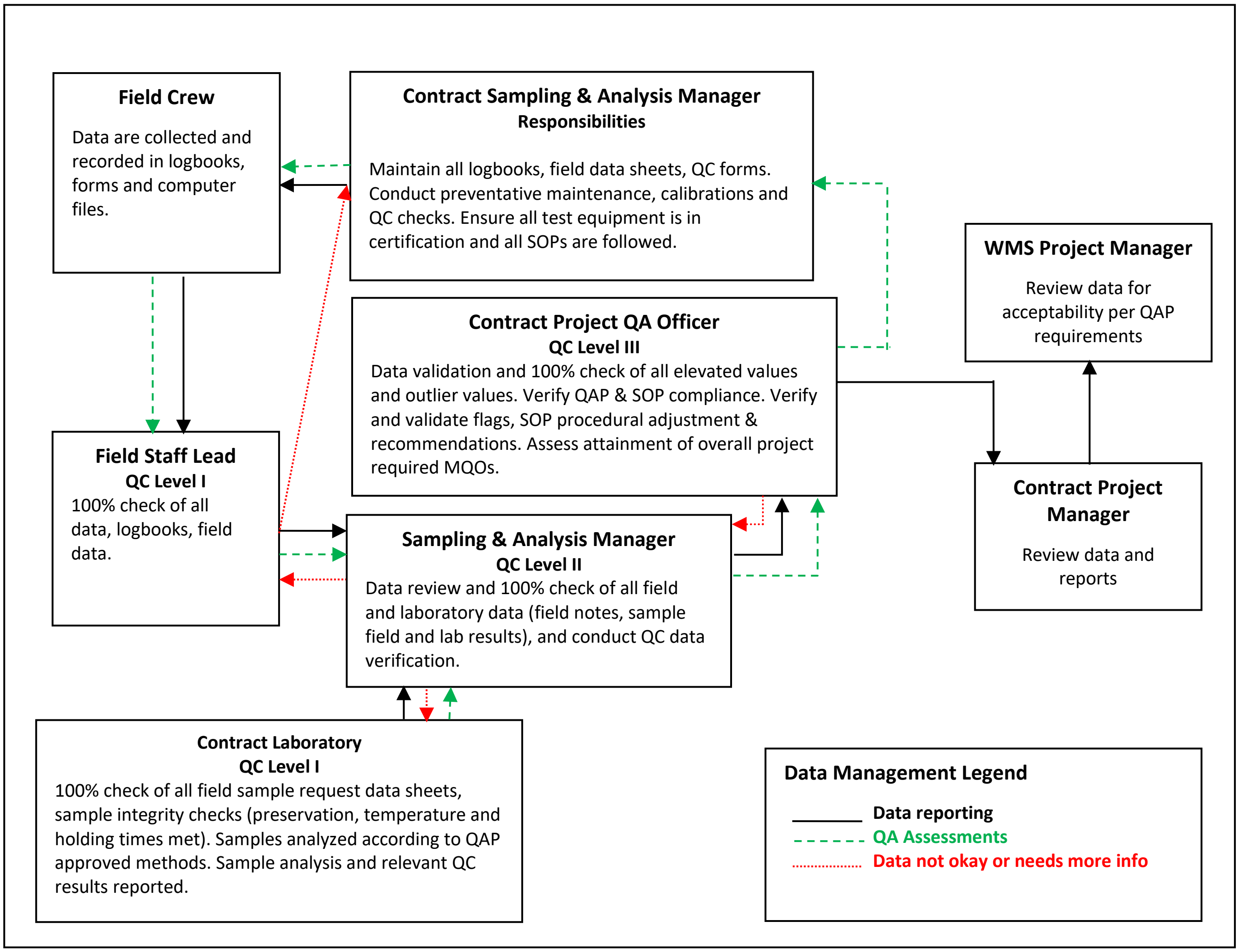
[3] Available at https://www.ncdc.noaa.gov/.

using a data logger download form to ensure data integrity and completeness. Data are typically transferred to databases in the office, and 100% of these data will be reviewed weekly.

Once the data are stored in the database for the monitoring project, the Contract Sampling and Analysis Manager will conduct a QC Level II review to check for data entry errors. Corrections for data entry errors are implemented as warranted. For spatial data, QC Level II review confirms that the data set was downloaded and projected properly and that the spatial locations are plotted correctly. For water quality data, the QC Level II is performed after uploading the laboratory-validated files. Data downloaded from data loggers will be imported into Excel files.

For all data types, the Contract QA Officer, or her/his designee, conducts a QC Level III review using queries and professional judgment to find identifiable errors, outliers, missing data, and data that do not meet the MQOs. Suspect data are investigated further and, if technically appropriate, they are corrected or flagged. Data will also be reviewed for indications of water quality concerns such as erratic or unexpectedly high or low results based on professional judgment. All data files will be backed up on the MOA server, and data will be stored for no less than 5 years.

Figure 4. Data Flow and QC Responsibilities



Field Crew

Data are collected and recorded in logbooks, forms and computer files.

Contract Sampling & Analysis Manager
Responsibilities

Maintain all logbooks, field data sheets, QC forms. Conduct preventative maintenance, calibrations and QC checks. Ensure all test equipment is in certification and all SOPs are followed.

WMS Project Manager

Review data for acceptability per QAP requirements

Contract Project QA Officer
QC Level III

Data validation and 100% check of all elevated values and outlier values. Verify QAP & SOP compliance. Verify and validate flags, SOP procedural adjustment & recommendations. Assess attainment of overall project required MQOs.

Field Staff Lead
QC Level I

100% check of all data, logbooks, field data.

Contract Project Manager

Review data and reports

Sampling & Analysis Manager
QC Level II

Data review and 100% check of all field and laboratory data (field notes, sample field and lab results), and conduct QC data verification.

Contract Laboratory
QC Level I

100% check of all field sample request data sheets, sample integrity checks (preservation, temperature and holding times met). Samples analyzed according to QAP approved methods. Sample analysis and relevant QC results reported.

Data Management Legend

———	**Data reporting**
- - - -	**QA Assessments**
········	**Data not okay or needs more info**

C. Assessment and Oversight

C.1 Oversight

As described in Section B.10, once data are reviewed by the Contract QA Officer data are submitted to the corresponding monitoring project database. If problems are discovered with data quality or management, it is the responsibility of the Contract QA Officer to address them in a timely manner.

Procedures for inspection, acceptance, calibration and maintenance of equipment and supplies are described in detail in Sections B.6, B.7, and B.8. If problems with data quality are traceable to equipment failure, inspection, calibration and maintenance will be scheduled more frequently.

The Contract QA Officer or the Contract Sampling and Analysis Manager will spot check field crews at 10% of the sampling locations/events to observe sample collection. If sampling technique problems are observed, corrective action will be taken immediately to resolve the problem. Observations of problems and corrective actions will be included in a corrective action report. The Contract QA Officer will submit corrective action reports to the MOA Project Manager or QA Officer within two business days of the identification of the need for corrective action. Corrective action reports will also be appended to each of the monitoring reports, as appropriate. Data quality assessment for completeness, accuracy, and precision will be included in each of the monitoring reports submitted to ADEC.

The contractor laboratory selected for the analyses will be certified in the EPA Discharge Monitoring Report – Quality Assurance (DMR-QA) study program for water/wastewater annually.

C.2 Revisions to QAP

The MOA Project Manager and Contract Project Manager will review this QAP and overall design of the monitoring plans annually and may suggest procedural refinements or additional testing procedures. This may include changes to procedures in use or new parameters to be measured. Minor revisions such as identified project staff, QAP distribution list, and minor editorial changes, will be made without formal review by ADEC. Other changes will be subject to ADEC review and approval.

C.3 QA Reports to Management

Table 11 provides the QA assessment reports, frequencies, and responsible individuals.

Table 11. QA Reports to Management

QA Report	Description	Presentation Method	Report Issued by	Frequency
Field Inspection Report	Description of field inspection results, audit methods, standards/equipment used, and any recommendations	Written text/tables	Contract QA Officer	Each field audit/inspection
Threshold Exceedance Report	If a threshold is exceeded, field work results and any recommendations	Email/telephone call	Contract Sampling and Analysis Manager	Each field inspection, as required
Corrective Action Recommendation	Description of problem(s), recommended action(s) required, time frame for feedback on resolution of problem(s)	Written text/table	Contract QA Officer or designated auditor	As required
Response to Corrective Action Report	Description of problem(s), description/date corrective action(s) implemented and/or scheduled to be implemented	Written text/table	Project Manager overseeing sampling and analysis	As required
3rd Party PT Sample (DMR-QA, etc.) Audit Report	Description of audit results, methods of analysis, and any recommendations	Written text and charts, graphs displaying results	3rd Party PT provider report issued to: -Lab QA Officer/Manager -Project QA Officer -ADEC DOW Compliance -ADEC DOW QA Officer [a]	Annually and as required by APDES permit
Data Validation	Data validation in comparison to MQOs	Data spreadsheet with data qualifiers; written text (as needed)	Contract QA Officer provides to Project QA Officer for review	With completion of each monitoring project or season
QA Report to Management	Summary assessment of whether QC measures are effectively meeting DQOs and corrective actions taken	Written text/tables	Contract QA Officer provides to Project QA Officer for review; ADEC Project Manager and ADEC DOW QA Officer receive with NPDES annual report	Annually

[a] It is the responsibility of contract laboratory to self-enroll and ensure reports are issued to ADEC.

PT = proficiency testing

D. Data Validation and Usability

D.1 Data Review, Verification, and Validation Requirements

The purpose of this section is to state the criteria used to review and validate data. These criteria will be used to accept, reject or qualify data in an objective and consistent manner. It is a way to decide the degree to which each data item has met its quality specifications as described in Section B.

Data review is the process that evaluates the overall data package to ensure procedures were followed and that reported data is reasonable and consistent with associated QA/QC results.

Data verification is the process of evaluating the completeness, correctness, and conformance/compliance of a specific data set against the method, procedural, or contractual requirements. The primary goal of data verification is to document that applicable method, procedural, and contractual requirements were met in field sampling and laboratory analysis. Verification checks to see if the data are complete, if sampling and analysis matched QAP requirements, and if SOPs were followed.

Data validation means determining if data satisfy QAP-defined use requirements; that is, that the data refer to the overall DQOs. Data validation is an analyte- and sample-specific process that extends the evaluation of data beyond method, procedural, or contractual compliance (i.e., data verification) to determine the analytical quality of a specific data set to ensure that the reported data values meet the quality goals of the environmental data operations (method specific data validation criteria).

The Contract QA Officer will be assigned to conduct data review, verification and validation as described in Sections B.10 and A.7. In addition, the MOA Project Manager or QA Officer will conduct data review following validation. Data that are obtained using equipment that has been stored and calibrated correctly and that meets the precision and accuracy DQOs will be used. Data that do not meet these objectives will be flagged.

D.2 Validation and Verification Methods

As described in Section B.10, the data verification and validation process includes three levels of QC. The Field Staff Lead and contractor laboratory are responsible for QC Level I. QC Level II is the responsibility of the Contract Sampling and Analysis Manager. The Contract Sampling and Analysis Manger will correct errors in data entry and will flag inconsistencies for further review. The Contract QA Officer will review data and flag any values that are outside of the MQOs range for each parameter. QC Level III review, including final data validation and verification will be conducted by the Contract QA Officer. The MOA Project Manager/QA Officer will review the validated data after entry into the database/spreadsheet.

The summary of all laboratory analytical results will be reported to the Contract Sampling and Analysis Manager. Data validation will be performed by the laboratory for all analyses prior to the release of data. All laboratory data will be validated according to the laboratory's QAP and SOPs and as specified in each monitoring plan. Laboratory reports will include the results of all QC data and the acceptance/rejection criteria used to validate/invalidate sample report data. The rationale for any anomalies in the QA/QC of the laboratory data will be provided to the Contract Sampling and Analysis Manager with the data results. Completed CoC forms (if required) will be sent back from the laboratory to the Contract Project Manager.

The laboratory will calculate and report the RPD and percent analyte recovery of analytical duplicate samples and MS/MSD samples. RPDs greater than the project requirements will be noted. The Contract

Project Manager and the Contract QA Officer will decide if any QA/QC corrective action will be taken if the precision, accuracy, and data completeness values exceed the project's MQO goals.

D.3.1 Practical Quantitation Limits

The PQLs are the lowest concentration that can be reliably achieved within specified limits of precision and accuracy for field and laboratory measurement methods. Estimated PQLs should be equal to or below the RL but above the MDL and are provided in Table 4.

The Contract QA Officer or his/her designee will calculate the RPD between field replicate samples.

The Contract QA Officer will also be responsible for reviewing the maintenance and calibration records to ensure all monitoring equipment in use are in compliance with this QAP (Sections B.6, B.7, and B.8). If data quality questions cannot be adequately resolved, data will not be entered into the database without being flagged as questionable. The Contract QA Officer will arrange for corrective measures (e.g., re-training, equipment recalibration).

D.3 Reconciliation with Data Quality Objectives

The Contract QA Officer will compare the results and associated variability, precision, accuracy and completeness with project objectives. If data quality indicators do not meet the program specifications established in Tables 2 through 4, data will not be entered into the database system, unless flagged. The cause of failure will be evaluated. If the cause is found to be equipment failure, calibration, and maintenance procedures will be reassessed and improved. In some cases, accuracy MQOs may be modified; when this occurs, strong rational justification for modification, problems associated with collecting and analyzing data, and potential solutions will be reported.

If failure to meet program specifications is found to be unrelated to equipment methods or field crew error, specifications may be revised. Revisions to this QAP will be submitted to ADEC for approval.

Appendix A

Pesticide Screening Monitoring Plan

This page intentionally left blank.

Table of Contents

Tables

Figures

1.0 Introduction

1.1. Background

The Municipality of Anchorage (MOA) is not an agricultural area and has predominantly urban use of pesticides within the municipality. Pesticide screening required by the National Pollutant Discharges Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit effective in 2010 recorded detectable amounts of pesticides in a lake in Anchorage for the first time. The Alaska Department of Environmental Conservation (ADEC) reissued the permit under the Alaska Pollutant Discharge Elimination System (APDES) program in August 2015 and August 2020. The 2020 APDES MS4 permit requires continued sampling of Lake Otis, Hideaway Lake, and Little Campbell Lake.

The term pesticide is defined by the State of Alaska to be “a chemical or biological agent intended to prevent destroy, repel, or mitigate plant or animal life, and any substance intended for use as a plant regulatory, defoliant, or dessicant, including insecticides, fungicides, rodenticides, herbicides, nematocides, and biocides.” For purposes of the stormwater program, the term pesticide includes herbicides, insecticides and fungicides (MOA 2000).

The pesticides used in the Anchorage area include broadcast pesticides such as insecticides and aphid spray applied by homeowners and localized pesticides (those pesticides applied along roads and trails most often by agencies). The MOA conducted a pesticide use survey (MOA 1999) and found seven pesticides were used most prevalently. Two of the most prevalent pesticides were selected for screening (MOA 2000). These two pesticides were Sevin FL (Carbaryl), which is used in the summer for aphid and spruce beetle control, and 2,4-D, a broadcast herbicide used by homeowners for lawn care and aquatic vegetation control.

The pesticide screening program was originally designed to collect screening data within areas that are most likely to accumulate pesticides. The U.S. Environmental Protection Agency (EPA) and ADEC suggested that sampling the water column of closed-basin lakes (lakes without defined surface water outlets) would meet the criteria. Three closed-basin lakes, Lake Otis, Hideaway Lake, and Little Campbell Lake, were sampled in 2011, 2013, 2016, and 2018.

Grab samples were collected from the water column at least 10 meters offshore of each lake. Samples were analyzed for 2,4-D and Carbaryl. The monitoring revealed detectable levels of 2,4-D in Hideaway Lake and Lake Otis in the 2013 water samples. 2,4-D and Carbaryl were not detected in the other years’ samples. These samples were the first in the history of the sampling program to find detectable levels of pesticides, though much lower than ADEC drinking water standard.

1.2. Problem Definition

Pesticides are used for a variety of reasons in the Anchorage area such as home application for lawn care, golf course maintenance, and industrial applications within utility corridors. The MOA also uses pesticides for maintenance of street landscapes, right-of-ways, and fields.

Pesticides are applied most commonly in the MOA area during the spring and summer months, which coincides with the heaviest rainfall period (July through September). The practice may cause applied pesticides to be washed into local waterways in runoff. Since degradation of some pesticides is slow, concentrations can accumulate in waterbodies even from the legal application of these chemicals.

Under the updated APDES permit, MOA must continue pesticide screening in the same three closed-basin lakes monitored under the previous permit: Lake Otis, Hideaway Lake, and Little Campbell Lake.

1.3. Goals and Objectives

The goal of this monitoring plan is to determine whether pesticides commonly used in the Anchorage area persist in the three lakes selected for monitoring. The objective of this pesticide screening program is to sample the water columns of the three lakes for 2,4-D and Carbaryl, the two most commonly used pesticides in the Anchorage area.

2.0 Description of Program and Rationale

2.1. Sampling Design

MOA will sample for 2,4-D and Carbaryl in each of the three lakes as representative pesticides. Three sample locations (Lake Otis, Hideaway Lake, and Little Campbell Lake) are depicted on **Error! Reference source not found.**. During years two and four (2022 and 2024) of the permit, sampling will be conducted during mid to late summer, as required in the APDES permit.

The previous APDES permit specified that pesticides are to be screened using a field immunoassay kit and any positive readings will be verified by a laboratory sample. However, immunoassay kits are no longer available for carbaryl. Therefore, the sampling design has been modified to include only laboratory sampling, as determined under the previous permit.

2.2. Schedule of Sampling

Pesticide screening will be conducted one time at each of the three lakes in 2022 and one time in 2024 in accordance with the APDES permit. Each sampling event will be conducted during mid to late summer. Ideally, sampling should occur following a rain event that follows a period of at least 48 hours of dry weather. Under these circumstances, pesticides that have been applied during dry weather would be most likely to wash off. Follow-up sampling will occur as soon as possible after receiving laboratory results should there be a detectable result.

3.0 Monitoring Locations

Water samples will be collected from approximately the deepest portions of Lake Otis, Hideaway Lake, and Little Campbell Lake, at least 10 meters from the shore. The locations coincide with those sampled under the previous permit and provide a sample representative of the overall water quality of the lake. Specific sample locations are shown in Figure A-2, Figure A-3, and Figure A-4and GPS coordinates are provided on the figures and in Table A-1.

Table A-1. GPS Coordinates of Sampling Locations

Site	Latitude (Deg., min., sec.)	Longitude (Deg., min., sec.)
Lake Otis	61° 11’28.91”	-149° 50’40.20”
Hideaway Lake	61° 07’23.24”	-149°44’33.90”
Little Campbell Lake	61° 09’45.51”	-150° 01’28.25”

Figure A-1

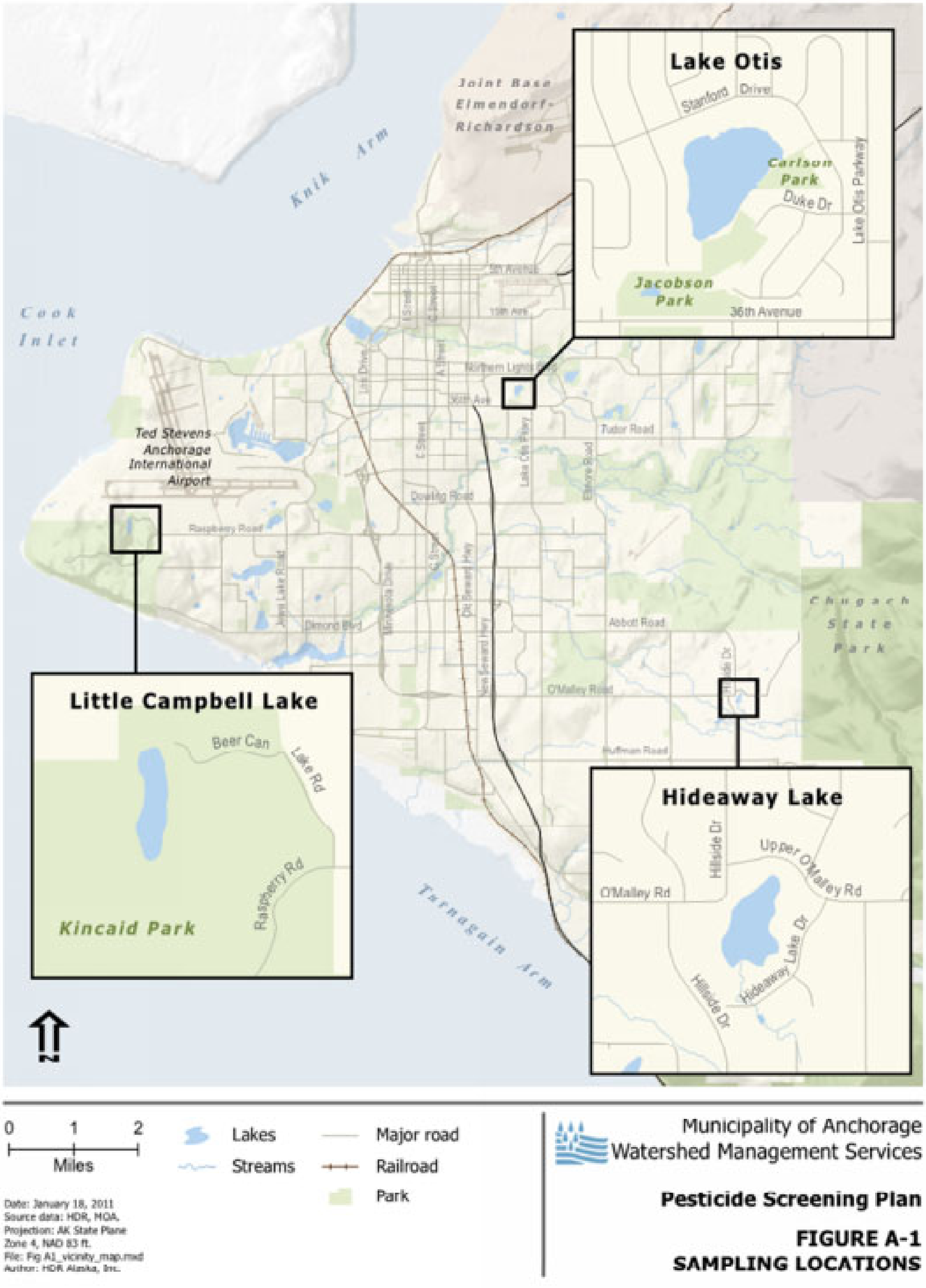

Lake Otis
Stanford Drive
Carlson Park
Duke Dr
Lake Otis Parkway
Jacobson Park
36th Avenue
Joint Base Elmendorf-Richardson
Knik Arm
Cook Inlet
5th Avenue
15th Ave
Northern Lights
36th Ave
Tudor Road
Ted Stevens Anchorage International Airport
Raspberry Road
Dowling Road
Elmore Road
Jewel Lake Road
Dimond Blvd
Minnesota Drive
C Street
Old Seward Hwy
New Seward Hwy
Lake Otis Pkwy
Abbott Road
O'Malley Road
Huffman Road
Hillside Dr
Chugach State Park
Little Campbell Lake
Beer Can
Lake Rd
Raspberry Rd
Kincaid Park
Turnagain Arm
Hideaway Lake
Hillside Dr
Upper O'Malley Rd
O'Malley Rd
Hideaway Lake Dr
N
0 1 2
Miles
Lakes
Streams
Major road
Railroad
Park
Date: January 18, 2011
Source data: HDR, MOA.
Projection: AK State Plane Zone 4, NAD 83 ft.
File: Fig A1_vicinity_map.mxd
Author: HDR Alaska, Inc.
Municipality of Anchorage
Watershed Management Services
Pesticide Screening Plan
FIGURE A-1
SAMPLING LOCATIONS

Figure A-2

0 100 200
Feet

Date: September 1, 2010
Source data: HDR, MOA.
Projection: AK State Plane
Zone 4, NAD 83 ft.
File: Fig A2_Lake Otis.mxd
Author: HDR Alaska, Inc.

⌖ Sample Location
🟩 Park

Municipality of Anchorage
Watershed Management Services

Pesticide Screening Plan

FIGURE A-2
SAMPLING LOCATION: LAKE OTIS

Figure A-3

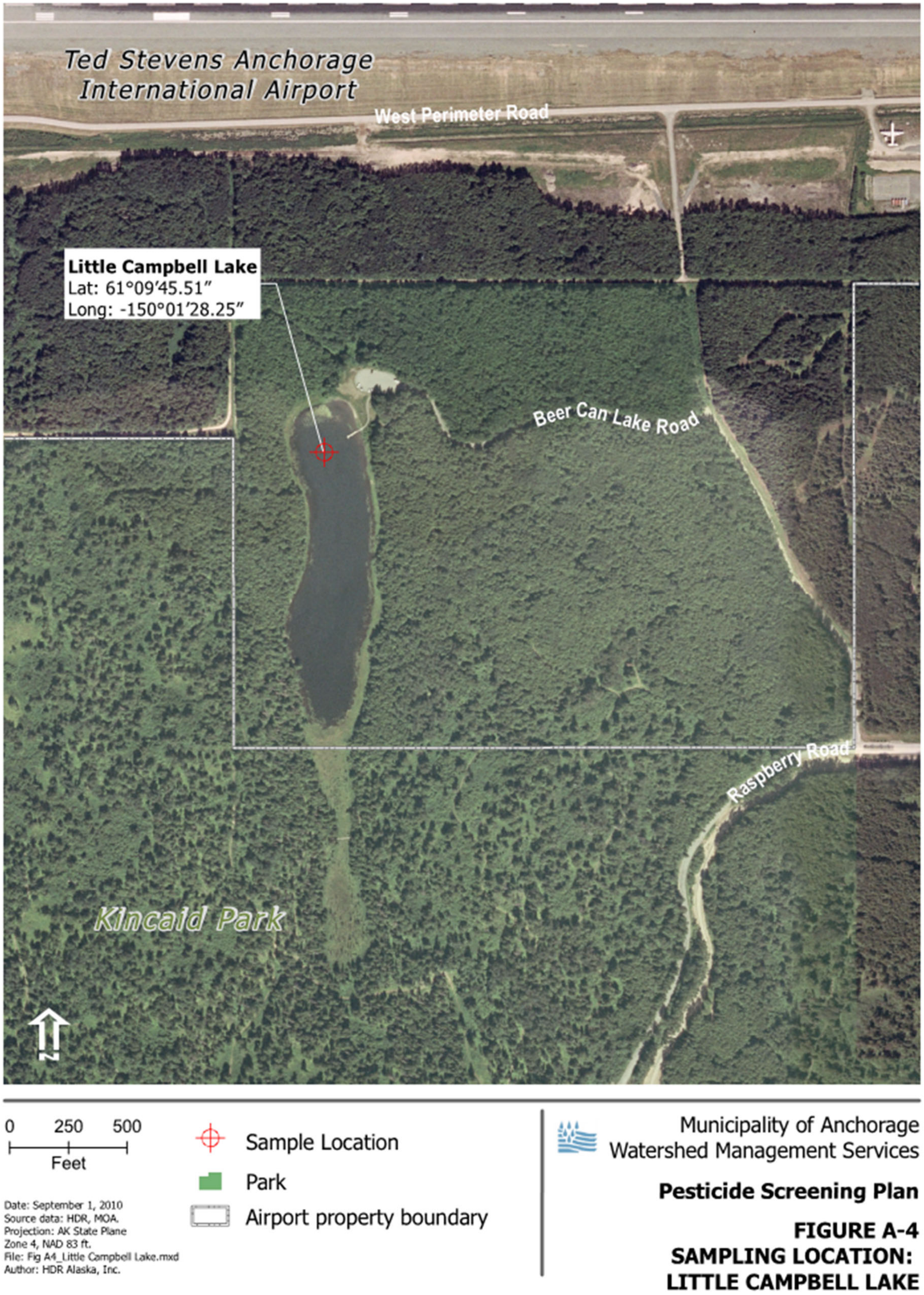
Date: September 1, 2010
Source data: HDR, MOA.
Projection: AK State Plane
Zone 4, NAD 83 ft.
File: Fig A3_Hideaway Lake.mxd
Author: HDR Alaska, Inc.

Municipality of Anchorage
Watershed Management Services

Pesticide Screening Plan

FIGURE A-3
SAMPLING LOCATION:
HIDEAWAY LAKE

Figure A-4



Date: September 1, 2010
Source data: HDR, MOA.
Projection: AK State Plane
Zone 4, NAD 83 ft.
File: Fig A4_Little Campbell Lake.mxd
Author: HDR Alaska, Inc.

Municipality of Anchorage
Watershed Management Services

Pesticide Screening Plan

FIGURE A-4
SAMPLING LOCATION:
LITTLE CAMPBELL LAKE

4.0 Parameters and Methods

Table A-2 lists the parameters and methods that MOA will use for analysis.

Table A-2. Parameters for Pesticide Screening

Parameter	Method	Analysis Location	Range
Temperature	SM 2550 B YSI 556 hand-held probe or equivalent	Field	-5 °C – 45 °C
pH	EPA 150.2 YSI 556 hand-held probe or equivalent	Field	0 – 14 STD
2,4-D	EPA 515.4	Laboratory	NA
Carbaryl	EPA 531.2	Laboratory	NA

°C = degrees Celsius; STD = standard units; NA = not applicable

5.0 Sampling Methods

5.1. Site Specific Sample Methods, Handling, and Field QC

One two-person team will conduct the field sampling when weather allows for safe boating conditions.

Samples will be collected from a location at least 10 meters from the shoreline and at approximately the deepest portion of each lake (using the approximate GPS locations from the previous study). The field crew will record the weather conditions, including ambient temperature, and the GPS coordinates of the sampling location. The crew will collect a single water column sample from 1 to 2 meters below the water surface using a Niskin bottle sampler. Water column temperature and pH will be recorded in the field notebook. Laboratory provided sample bottles will be filled for the pesticides analyses.

The Niskin sampler will be decontaminated between each use. Decontamination procedures are described in Appendix F of the Quality Assurance Plan (QAP).

5.2. Sample Preservation and Packing

The pesticide samples will be collected, preserved, and packed for shipment to the laboratory as described in the QAP.

5.2.1. Chain of Custody

Use and completion of the chain of custody forms is provided in Appendix F of the QAP.

5.3. Field Instrument Calibration

Instrument calibration is addressed in Appendix G of the QAP. Each field instrument will be calibrated daily according to the manufacturer's directions provided with the instrument.

6.0 Training

Each field crew member will learn and demonstrate his/her ability to safely operate the boat; properly perform all field tests, calibrations, and sampling procedures; and accurately report the information prior to conducting sampling.

7.0 Report

A brief report will be prepared following each sampling event to be appended to the annual APDES report. The report will include a description of the sampling event, field and laboratory results, a discussion of the results, and any recommended changes to the protocols for future sampling events.

8.0 References

MOA (Municipality of Anchorage). 1999. Pesticide Screening at Anchorage Alaska, Conceptual Design. Prepared by CH2M Hill, Inc. Prepared for Watershed Management Section, Municipality of Anchorage. December 1999. Publication No. W MP App 99003.

———. 2000. Draft Pesticide Sampling Anchorage Alaska, Data Report. Prepared by CH2M Hill, Inc. Prepared for Watershed Management Section, Municipality of Anchorage. December 2000. Publication No. WMP APR00006.

This page intentionally left blank.

Appendix B

Stormwater Outfall Monitoring Plan

This page intentionally left blank.

Table of Contents

Tables

Attachments

1.0 Introduction

1.1. Background

In 1999 the U.S. Environmental Protection Agency (EPA) issued the Municipality of Anchorage (MOA) and the Alaska Department of Transportation and Public Facilities a Municipal Separate Storm Sewer System (MS4) permit under the National Pollutant Discharge Elimination System (NPDES). The EPA re-issued the permit, effective February 2010, with a requirement to conduct stormwater outfall monitoring. Outfall monitoring was required at ten priority stormwater outfalls beginning in the second year of the permit. In 2015, the permit became administered by the Alaska Department of Environmental Conservation (ADEC) under the Alaska Pollutant Discharge Elimination System (APDES). The ADEC re-issued the permit as APDES permit AKs052558 without changes to this requirement in August 2015 and again in August 2020.

The APDES permit identifies a number of objectives for monitoring. The objective most relevant to stormwater outfall monitoring is to broadly identify fecal coliform and petroleum product loading from stormwater. To accomplish this objective, a variety of land uses must be included in stormwater outfall monitoring to ensure representative water quality conditions across the MS4.

1.2. Problem Definition

Stormwater outfall monitoring is conducted to characterize the water quality of stormwater that is discharged to waters of the United States (in this case, streams, creeks, and rivers). Storm drains that discharge to the MS4 can introduce pollutants in runoff from commercial and industrial facilities, residential areas, and even parks. This monitoring plan is designed to characterize the quality of the stormwater, with respect to specific pollutants discharged to the MS4 pursuant to the APDES permit requirements.

1.3. Goals and Objectives

The goal of the MOA's stormwater monitoring program is to obtain sufficient data to characterize the quality of the stormwater runoff for pollutants identified in the permit. By monitoring the same outfalls over the five-year permit period, the results should provide a qualitative characterization to meet the objectives originally identified in the NPDES Permit Fact Sheet (EPA 2009) and carried forth in the subsequently issued APDES permits.

The stormwater outfall monitoring program will measure pollutants and pollutant indicators during precipitation events that generate runoff at ten high priority stormwater outfall sites. The monitoring program will allow MOA to meet the ADEC objectives. In preparing the permit, ADEC anticipated that the stormwater outfall monitoring would address the following objectives:

- Broadly estimate the annual pollutant loading for fecal coliform bacteria and petroleum products discharged to impaired receiving waters from the MS4;
- Assess the effectiveness and adequacy of at least two stormwater control measures implemented through the permit term in reducing fecal coliform bacteria and petroleum products;
- Identify and prioritize those portions of the MS4 requiring additional controls; and
- Have an updated monitoring and evaluation plan available upon request by the ADEC.

2.0 Description of Program and Rationale

2.1. Sampling Design

Each year beginning in the spring of 2011 ten priority outfalls have been sampled four times when there is sufficient precipitation to generate runoff. This sampling will continue throughout the term of the current permit, beginning in 2021. Samples will be analyzed for pollutants that serve as indicators of illicit discharges. At each outfall the following parameters will be monitored to evaluate the quality of the stormwater: flow, dissolved oxygen (DO), pH, temperature, turbidity, 5-day biochemical oxygen demand (BOD_5), fecal coliform, and total suspended solids (TSS). For outfalls whose tributary land uses are predominantly commercial, industrial, or paved collector or arterial streets or parking lots, samples will also be analyzed for total aromatic hydrocarbons (TAH) and total aqueous hydrocarbons (TAqH).

2.2. Outfall Selection Methodology and Rationale

The stormwater outfall monitoring prescribed in the permit requires the MOA to monitor specific water quality parameters and flow four times each year at ten locations. To best meet the permit objectives as described in Section 1.3, the outfalls selected should represent a diversity of land uses.

A list of 30 outfalls prioritized to identify “medium” and “high” priority monitoring locations was developed in 2011. This list of 30 outfalls will be used for the current permit. A subset of ten outfall locations will be selected from this list for sampling during the five-year permit cycle.

The MOA developed a selection process for identifying the outfalls in 2011. First, MOA identified the following criteria for targeted monitoring within the Anchorage Basin:

- Include a variety of land uses.
- Include storm drains that discharge to waterbodies listed as impaired under Section 303 (d) of the Clean Water Act .
- Experience approximately the same annual precipitation.
- Be geographically diverse while allowing relatively easy access to all outfalls during a single rainfall event.

To meet these criteria, MOA selected a portion of the MS4 that extends from C Street on the west to Lake Otis Parkway on the east, and from the northern portion of the Chester Creek watershed to the southern edge of the Furrow Creek watershed. The targeted area includes substantially urbanized portions of the watershed tributaries to Chester Creek, Furrow Creek, and Campbell Creek. These three streams are impaired for fecal coliform and have an approved Total Maximum Daily Load (TMDL), meeting one of the permit objectives.

Within the target area, the MOA prioritized outfalls representative of homogeneous land use subbasins, heterogeneous land use subbasins, and subbasins with and without oil/grit separator (OGS) devices. This diversity of land uses and structures will be used to meet the permit objectives of broadly quantifying pollutant loading and assess effectiveness of existing best management practices (BMPs).

For the subbasins with a homogeneous land use:

- Data will identify specific pollutants originating from a predominant land use that require additional controls. Specific controls could be tailored to a specific land use and targeted for use in those watersheds.
- Data may be used to develop estimates of fecal coliform and TAH loading.
- Fecal coliform, TAH, and TAqH data can be compared to water quality criteria.
- Fecal coliform data can be compared with TMDL reduction goals for fecal coliform to determine

improvement over time.

For subbasins with heterogeneous land uses:

- Data will be used to develop estimates of fecal coliform and petroleum hydrocarbon loading.
- Data will identify pollutants originating across land uses that require additional controls, and additional BMP controls that can be applied across the basin.
- Fecal coliform and petroleum hydrocarbon data can be compared to water quality criteria.
- Fecal coliform data can be compared with TMDL reduction goals for fecal coliform to determine improvement over time.

For subbasins with or without OGS systems:

- Data will be used to assess the effectiveness of the OGS systems and determine whether installation of additional OGS systems would improve stormwater quality.
- Petroleum hydrocarbon data can be compared to water quality criteria.

MOA used its hydrogeographic database (HGDB) and other municipal geographic data to select subbasins with the aforementioned characteristics. The HGDB contains information about streams; drainage ways; storm drainage piping, inlets, outlets, and outfalls; stormwater treatment devices (such as the OGS systems); and subbasins. Specifically, subbasins are delineated based on hydrologic divides between drainage areas or piped drainage networks and are generally associated with one or more outlets or outfalls. The HGDB is a living database that is continually updated to reflect refinements in mapping and changes on the ground. Thus, information from the HGDB should be used with this qualification.

The HGDB and other MOA GIS datasets including zoning, aerial photography, and topographic information were used to characterize land use in the delineated subbasins or to determine the presence or absence of OGS systems associated with subbasins. Using these data and GIS tools, 60 subbasins were selected, representing the following:

- Subbasins zoned for a single predominant land use (homogeneous subbasins). The land uses were specifically categorized as:
    - Residential (R; single, dual, and multifamily residential)
    - Commercial/Industrial (CI; e.g., railroad right-of-ways and transportation corridors)
    - Institutional (e.g., schools and hospitals)
    - Parks and vacant land
- Subbasins zoned for a high variety of land uses (heterogeneous subbasins). These were identified as those with the smallest standard deviation of the percentages of each of the four categories of land uses.
- Subbasins known to include OGSs and those without OGSs.

With approximately 60 subbasins identified, those subbasins that did not have stormwater outfalls that are part of the MS4, as defined in 40 CFR122.26 (b)(9),[1] were eliminated from the selection process.

Next, the remaining outfalls were ground-truthed to ensure:

- Outfalls could be located;
- Sampling locations were safely accessible (from the perspective of vehicular and sampler access);
- Outfalls were not submerged in the receiving stream; and

---

[1] At the point where a municipal separate storm sewer discharges to waters of the United States and does not include open conveyances connecting two municipal separate storm sewers, or pipes, tunnels or other conveyances which connect segments of the same stream or other waters of the United States and are used to convey waters of the United States.

- Outfalls had an elevation drop between the outfall and the receiving steam to allow outfall discharge to be collected prior to stream mixing.

The resulting list of outfalls comprised the 30 priority outfalls required by the permit to be identified. All of the outfalls identified through this process are considered eligible for sampling as they meet the intended objectives of: 1) discharging to impaired water bodies; 2) representing a variety of land uses and associated pollutants; and 3) representing discharges with and without BMPs. The list of subbasins and outfalls is provided in Table B-1.

The final ranking of the 30 sites included an element of practicality based on field ground- truthing to ensure outfalls could be sampled and eliminate the need to identify those during field sampling. Wet weather sampling will be conducted under wet, inclement weather conditions, and must be done quickly to capture runoff from temporary events. Therefore, the ten priority sites were selected using a metric that characterized three factors:

A. Likelihood of having discharge – as measured by the impervious area directly connected to the storm drain system leading to the outfall, as opposed to the entire subbasin. Outfalls were ranked from 1 to 30.
B. Safe Access – safety of the ingress to the outfall, such as steep slopes and proximity to large and/or deep flows, was evaluated. Outfalls were assigned a value of 1, 3, or 5 (very good, adequate, or caution advised, respectively).
C. Accessibility – distance and convenient legal parking were evaluated. Outfalls were assigned an integer value from 1 through 5, from no road to cross and short (< 20 yard) walking distance (1) to cross or walk along a busy road and walk more than 20 yards (5).

A rating metric, R, was assigned to each outfall using the following equation:

$$R = 3 - \left(\frac{A}{30} + \frac{B}{5} + \frac{C}{5}\right)$$

The equation resulted in a number between 0 and 3; these numbers were ranked from 1 to 30, with low numbers representing higher priority sites and higher numbers representing lower priority sites. The ten highest ranked sites were considered priority sites for monitoring throughout the term of the permit. Adjustments may be made pending the inclusion of additional information that may make a site unsuitable for sampling, such as identification of groundwater inflow to a storm drain system, change in accessibility, change in land ownership and other factors. The prioritized list of sites is included in Table B-1.

Since a given subbasin may have more than one outfall and may be comprised of more than one land use, each of the prioritized outfalls was assigned a land use category for the area actually contributing to the outfall. Land uses of R, CI, (defined above) and M (for mixed) were assigned based on aerial photography and the associated piped or ditch system leading to the outfall. The presence or absence of an OGS device on the portion of the MS4 system leading to the outfall was determined from information in the HGDB. These land use and OGS categories are also shown in Table B-1.

Table B-1. Priority Outfalls Identified in 2011 for Stormwater Outfall Monitoring

Subbasin ID	Watershed	Contributing Land Use [a]	OGS Present?	Priority Rank
10 Identified Priority Outfalls				
805	Campbell Creek	CI	Yes	1
219	Chester Creek	R	Yes	2
1224a	Campbell Creek	R	Yes	3
132	Chester Creek	CI	Yes	4
554	Chester Creek	M	No	5
549	Chester Creek	M	No	6
1224b	Campbell Creek	R	Yes	6
133 [b]	Chester Creek	CI	No	8
507	Chester Creek	CI	No	8
1040b	Campbell Creek	R	No	10
Medium Priority Outfalls				
619	Chester Creek	R	Yes	11
1040a	Campbell Creek	R	No	12
320	Campbell Creek	R	No	13
523	Chester Creek	M	Yes	14
127	Chester Creek	M	Yes	15
815	Campbell Creek	M	Yes	16
1210 [b]	Campbell Creek	CI	No	17
497	Chester Creek	R	Yes	18
580	Chester Creek	R	Yes	18
737	Campbell Creek	R	Yes	18
505	Chester Creek	R	Yes	21
1197	Campbell Creek	R	Yes	21
495	Chester Creek	M	No	23
1198	Campbell Creek	R	Yes	23
828	Campbell Creek	R	Yes	25
404	Campbell Creek	M	Yes	26
610	Chester Creek	CI	Yes	27
1050	Furrow Creek	R	No	28
389	Campbell Creek	CI	No	29
1199	Campbell Creek	CI	No	29

[a] R = Residential; CI = Commercial and Industrial; M = Mixed

[b] 133 was replaced by 1210 due to poor condition at the end-of-pipe on 133.

2.3. Schedule of Sampling

Stormwater outfall monitoring will be conducted during up to four rain events that result in runoff each year in accordance with the permit. The team will be prepared to conduct monitoring when weather predictions indicate that a rainfall event sufficient to produce runoff is probable. Since stormwater outfall monitoring activities are weather dependent, the exact dates of sampling events will vary from year to year. There may be years in which fewer than four storm events will be sampled due to insufficient runoff generation.

3.0 Monitoring Locations

The outfalls from which the ten sampling sites will be selected from are listed in Table B-1. The ten sampling locations will be sampled up to four times per year throughout the duration of the permit, resulting in a total of 20 samples that will be collected at each outfall prior to the expiration of the permit.

The ten highest priority sites listed in Table B-1 were sampled every year from 2011 through 2016. Beginning in 2017 two outfalls, from subbasins 1040b and 1210, were replaced. Outfall 1040-3 from subbasin 1040b was discontinued due to inconsistent flow and the small size of the drainage area. The replacement outfall, outfall 348-3 from subbasin 1103, also drains a residential land use area and has a larger drainage area. Outfall 847-1 from subbasin 1210 was discontinued when it was determined that a majority of the flow from the outfall was streamflow from Little Campbell Creek. It was replaced with outfall 1454-1 from subbasin 1449, which also drains a commercial and industrial land use subbasin. The replacement outfalls were selected based on the similar land use categories and similar physical characteristics of the original outfalls rather than selecting the next two outfalls on the priority list so as not to impact the statistical analysis of this long-term monitoring program.

Table B-2 lists the outfalls planned for sampling under the stormwater outfall monitoring program in the current permit cycle. Outfalls may be reevaluated for sampling as necessary.

Table B-2. Outfalls to be Sampled

Subbasin ID	Outfall Node ID	Watershed	Contributing Land Use	OGS Present	Latitude	Longitude
1224a	1224-1	Campbell	R	Yes	61° 09.548'	-149° 52.443'
1224b	1224-2	Campbell	R	Yes	61° 09.545'	-149° 52.451'
805	207-1	Campbell	C/I	Yes	61° 10.202'	-149° 52.326'
219	314-22	Chester	R	Yes	61° 11.996	-149° 50.750'
507	484-1	Chester	C/I	No	61° 12.100'	-149° 52.114'
549	86-1	Chester	Mixed	No	61° 12.095'	-149° 52.114'
132	499-1	Chester	C/I	Yes	61° 12.176'	-149° 52.554'
554	525-2	Chester	Mixed	No	61° 12.161'	-149° 52.486'
e	348-3	Furrow	R	No	61° 06.448'	-149° 52.734'
1449	1454-1	Campbell	C/I	No	61° 09.758'	-149° 52.525'

4.0 Parameters and Methods

Table B-3 lists the field and laboratory parameters, type of samples, frequency of monitoring, and the sample timing method, and purpose of the analysis. MOA will use a field probe, such as a YSI 556 or equivalent and the Hach 2100P, to monitor field water quality parameters. These instruments will serve as an instantaneous recording device for temperature, turbidity, DO, and pH at the outfall. An electromagnetic velocimeter or bucket will be used to measure instantaneous flow dependent upon outfall conditions. Outfalls dominated by commercial, industrial, or paved collector or arterial streets or parking lots are likely to contribute petroleum hydrocarbon pollutants to stormwater and will be monitored for TAH and the TAqH in addition to the other parameters.

Table B-3. Sample Frequency and Parameters

Parameter	Type of Sample [a]	Frequency	Sample Timing	No. of Measurements in Permit Cycle	Method	Monitoring Objective
Flow	IR	4 times/year	Catch runoff from the storm event	20	Acoustic doppler or bucket	Characterize flow
DO	IR	4 times/year	Catch runoff from the storm event	20	EPA 360.1/ YSI 556	Characterize stormwater quality
pH	IR	4 times/year	Catch runoff from the storm event	20	EPA 150.2/ YSI 556	Characterize stormwater quality
Turbidity	IR	4 times/year	Catch runoff from the storm event	20	EPA 180.1 M/ YSI 556	Characterize stormwater quality
Temperature	IR	4 times/year	Catch runoff from the storm event	20	SM2550B/ YSI 556	Characterize stormwater quality
BOD5	G	4 times/year	Catch runoff from the storm event	20	SM 5210 B	Characterize stormwater quality
Fecal Coliform	G	4 times/year	Catch runoff from the storm event	20	SM 9222D	Characterize stormwater quality; estimate loading
TSS	G	4 times/year	Catch runoff from the storm event	20	SM 2540D	Characterize stormwater quality
Copper, dissolved	G	4 times/year	Catch runoff from the storm event	20	EPA 200.8	Characterize stormwater quality
Hardness	G	4 times/year	Catch runoff from the storm event	20	SM 2340B	Characterize stormwater quality
TAH	G	4 times/year	Catch runoff from storm event in areas where commercial and industrial land uses are predominant	20	EPA 624	Characterize stormwater quality; estimate loading

[a] IR = instantaneous recording of field analysis; G = grab sample for laboratory analysis

4.1. Site-Specific Non-Direct Measurements

Prior to entering the field, the field crew will assess the predicted rainfall to ensure the event will produce runoff. They will refer to real-time data available from meteorological stations in the Anchorage area to determine if sampling should occur. They will familiarize themselves with the locations of the outfalls.

Upon arriving at each outfall, the field crew will record the following information in the field logbook:

- Time of sampling
- Vegetation surrounding the outfall
- Outfall water conditions
    - Odors
    - Color
    - Clarity
    - Floatables
    - Deposits or stains
    - Sheen
    - Surface scum
    - Debris
- Other unusual conditions.

Following storm event sampling, the field crew will download the data associated with the tipping rain gages within each subbasin sampled. During precipitation events, the collection cup in the gauge collects precipitation until it reaches the equivalent of 0.01 inches of precipitation where upon the bucket tips, triggering a reed switch and recording an event with a time stamp. These events are stored in the data logger and downloaded into a computer program where they can be summarized over different time intervals or graphed over time to produce a hyetograph.

A minimum of three rain gauges are to be located within the sampling corridor. The gauges will be installed off Boniface Parkway between Debarr and East Northern Lights Boulevard (“Nunaka”), near Lake Otis Parkway and Tudor Road (“Thomas”), at the Lynwood Retention Basin (“Lynwood”), and in South Anchorage near Elmore and Huffman Roads (“Spencer”) and represent the northern, middle, and southern portions of the study area respectively. Rain gauge locations may be adjusted as necessary.

In addition to preparing the hyetographs for the storm event, they will record:

- Time rain event began
- Total 24-hour rainfall.

5.0 Sampling Methods

5.1. Site-Specific Sampling Methods, Handling, and Field QC

One two-person team will conduct the stormwater outfall sampling when weather permits. Sampling will be conducted only during or after a storm event that creates runoff in the MS4. Typically, a measurable storm event will be defined as rain of greater than or equal to 0.1 inch in 24 hours preceded by 24 hours of less than 0.1 inch of precipitation. This size event is expected to generate runoff from the basin and should provide adequate opportunities to capture four rain events per year.

The team will have the outfall list, site maps with outfall areas, the locations of the rain gages in each subbasin, buckets, flow meter, water quality meters, laminated water analysis sampling protocols, a digital camera, measuring tape, ruler, a stop watch, field logbook, and data forms. At each outfall, team members will record the general information listed in Section 4.1.

5.1.1. Flow Analyses

From a position of safety, the field crew will obtain a velocity measurement using an electromagnetic velocimeter. After the velocity of the water flowing out of the outfall has been measured, the field team will determine the depth of water flowing out of the outfall with a ruler. They will use the appropriate equation to calculate discharge by using the size of the outfall, the depth of the water, and the velocity measured on site.

If the electromagnetic velocimeter cannot be used at a site due to shallow water conditions, the crew will measure the length of time required to fill a calibrated 1- or 5-gallon bucket using a stopwatch. They will repeat the measurement four times to obtain an average discharge rate. At the office, they will calculate gallons per unit of time and convert to cubic feet per second (cfs).

5.1.2. Water Quality Sampling

After measuring flow, the field crew will measure pH, temperature, DO, and turbidity, using a field probe such as a YSI multi-unit sensor. The probe will be placed in the discharge stream. Field measurements will be recorded on the field form.

The crew will obtain water samples necessary to fill the laboratory bottles for BOD, TSS, fecal coliform, and TAqH. The water quality samples will be collected samples from the water flowing out of the end-of-pipe. Sample crews should take care not to disturb any accumulated sediment when collecting a water sample.

Once the water samples have been collected, the field crew will record visual observations and measurements. Visual observations include the clarity of the water and its color, debris, oily sheen and surface scum.

The field team will conduct equipment blank analyses prior to field mobilization of a specific wet weather sampling event. Equipment blank procedures are described in the Quality Assurance Plan (QAP). The field crew will collect replicate laboratory samples and record replicate field measurements at a rate of 15 percent or 1 per day, whichever is greater. Replicate sampling procedures are described in the QAP.

5.2. Sample Preservation and Packing

BOD, TSS, fecal coliform, and TAqH samples will be collected, preserved, and packed for shipment to the laboratory as described in the QAP.

5.2.1. Chain of Custody

Instructions for the use and completion of the chain of custody forms are provided in Appendix F of the QAP.

5.3. Field Instrument Calibration

Instrument calibration is addressed in Appendix G of the QAP. The specified field probe will be calibrated each day it will be used in the field according to the manufacturer’s directions and for each parameter to be monitored.

6.0 Training

Each field crew member must be familiar with the following prior to conducting field work:

- Field safety
- Downloading precipitation data
- Proper flow monitoring
- Proper and complete recording of data on field logbook

- Calibration and operation of all field water quality monitoring equipment
- Sampling protocols
- Visual monitoring requirements
- Field quality control samples
- Sample preservation and packaging
- Chain of custody completion
- Laboratory location.

Before field crew members are allowed to do reportable work, they must demonstrate competence in conducting field analyses. A field crew member experienced in wet weather sampling protocols will ensure that new field crew members are competent in all field procedures and test protocols.

7.0 Report

The results of the stormwater outfall monitoring program will be used for several purposes. The monitored parameters will be compared to water quality criteria where water quality standards are promulgated. If there are exceedances, the MOA will identify likely causes and take actions such as education and outreach or installation of additional BMPs to reduce pollutant loading.

An annual report of the results of stormwater outfall monitoring will be prepared. This report will include dates of sample collection, location, analyses performed, results and analysis. If water quality criteria have been exceeded, those results will be noted. In analyzing the results, the following will be completed:

- Calculate the median, range, and 90th percentile of concentrations measured for each parameter, except fecal coliform. For fecal coliform, the geometric mean will be calculated. A separate evaluation of concentrations may be conducted by land use, if differences are noted between land uses.
- Evaluate whether differences in stormwater quality exist between basins with and without OGSs.
- Estimate fecal coliform loading in each of the subbasins. The results will be used to estimate loading across the MOA MS4 using the methodology described below.
- Estimate TAH and TAqH loadings in each of the subbasins where commercial and industrial land uses predominate. The results will be applied to estimate loading across the MOA MS4 using the methodology described below.

Depending on the results, one of several methods may be used to estimate fecal coliform and TAH/TAqH loadings. The approach used will be selected based on the nature of the monitoring results and the complexity of applying a given approach.

One option is to use the median and 90th percentile concentrations of the samples obtained across all sample dates to calculate loading using the Simple Method (SMRC 2010; see Attachment B-1). The concentrations obtained for specific subbasins will be extrapolated to other subbasins of similar land use and treatment levels (i.e., presence or absence of OGSs) for those basins that discharge to the 303(d) impaired water bodies.

The Simple Method was developed under an EPA grant to provide Phase II communities with tools to protect their local watersheds (SMRC 2010). This method estimates stormwater runoff pollutant loads for urban areas and requires the following information: subbasin drainage area and impervious cover, flow weighted or event mean stormwater runoff pollutant concentrations, and annual precipitation. Using the Simple Method, calculations can be based on specific land use areas, such as residential, commercial, industrial, and roadway to calculate annual pollutant loads for each type of land use. It can also be used to calculate more generalized pollutant values for land uses such as new suburban areas, older urban areas, central business districts, and highways. Calculations using the Simple Method are described in

Attachment B-1. Note that this method has the limitations when applied to grab samples rather than flow-weighed data, to data with high variability, and to watersheds greater than one square mile (Ohrel 2000). Also note that available documentation for this method does not address its applicability to organic compounds such as petroleum hydrocarbons.

A second method for estimating loadings is to apply different concentrations seasonally, as performed in the TMDLs for Campbell and Furrow Creeks (ADEC 2004, 2006). The applicability of this approach would depend on whether it is possible to discern seasonal differences in the samples obtained. Again, the Simple Method would then be applied to specific land uses to generate estimates for the various land use types and amount of impervious area.

A third approach for estimating loadings is that employed for the Chester Creek TMDL (ADEC 2005) which coupled surface runoff and water quality data in the Storm Water Management Model (SWMM). The SWMM model simulates the quantity and quality of stormwater runoff in urban watershed (ADEC 2005). Other models, such as the Hydrologic Simulation FORTRAN Model, could also be considered if this approach is followed.

Finally, because the highly variable nature of fecal coliform, an approach suggested by flow duration curve analysis (USEPA 2007) may be determined to be more appropriate and therefore employed.

8.0 References

ADEC (Alaska Department of Environmental Conservation). 2004. Total Maximum Daily Loads (TMDLs) for Fecal Coliform in the Waters of Furrow Creek in Anchorage, Alaska. March 2004. Accessed at https://dec.alaska.gov/media/15879/furrowcreek.pdf on January 11, 2021.

———. 2005. Total Maximum Daily Load for Fecal Coliform in Chester Creek, University Lake, and Westchester Lagoon, Anchorage, Alaska. May 2005. Accessed at https://dec.alaska.gov/media/15244/chester-creek-university-lake-westchester-lagoon-fecal-dec-2005.pdf on January 11, 2021.

———. 2006. Total Maximum Daily Loads (TMDLs) for Fecal Coliform Bacteria in the Waters of Campbell Creek and Campbell Lake in Anchorage, Alaska. May 2006. Accessed at https://dec.alaska.gov/media/15243/campbell-creek-lake-fecal-tmdl-dec-2006.pdf on January 11, 2021.

Ohrel, R. 2000. Simple and Complex Stormwater Pollutant Load Models Compared. In T. Schueler and H.K. Holland (Eds.), *The Practice of Watershed Protection*. Center for Watershed Protection, Ellicott City, Maryland.

SMRC (Stormwater Managers Resource Center). 2010. The Simple Method to Calculate Urban Stormwater Loads. Accessed at https://www.stormwatercenter.net/monitoring%20and%20assessment/simple%20meth/simple.htm on January 11, 2021.

USEPA (U.S. Environmental Protection Agency). 2007. An Approach for Using Load Duration Curves in the Development of TMDLs. EPA 841-B-07-006. August 2007. Accessed at https://www.epa.gov/sites/production/files/2015-07/documents/2007_08_23_tmdl_duration_curve_guide_aug2007.pdf on January 11, 2021.

———. 2009. Fact Sheet for AKS-0522558. July 17, 2007.

This page intentionally left blank.

Attachment B-1

Simple Method to Calculate Stormwater Loading

This page intentionally left blank.

Note: This information is reproduced from The Stormwater Managers Resource Center website.

Introduction

The Simple Method estimates stormwater runoff pollutant loads for urban areas. The technique requires a modest amount of information, including the subwatershed drainage area and impervious cover, stormwater runoff pollutant concentrations, and annual precipitation. With the Simple Method, the investigator can either break up land use into specific areas, such as residential, commercial, industrial, and roadway and calculate annual pollutant loads for each type of land, or utilize more generalized pollutant values for land uses such as new suburban areas, older urban areas, central business districts, and highways.

Stormwater pollutant concentrations can be estimated from local or regional data, or from national data sources. Tables 1 through 3 summarize pollutant concentration data for Total Suspended Solids (Table 1)[2], Total Phosphorous (Table 2)[3], and Total Nitrogen (Table 3)[4] for residential, commercial, industrial, and roadway land uses, and identify default values. Table 4[5] identifies pollutant concentration values for Phosphorus, Nitrogen, COD, BOD, and some metals for more generalized land use categories. In general, the selected data sources are nationwide in scope, or are summaries of several regional studies. Some studies included in these data did not characterize stormwater concentrations for specific land uses, and instead reported a concentration for "urban runoff." In these instances, the data are reported as the same concentration for each land use in Tables 1 through 3.

Fecal coliform is more difficult to characterize than other pollutants. Data are extremely variable, even during repeated sampling at a single location. Because of this variability, it is difficult to establish different concentrations for each land use. Although some source monitoring data exists (Steuer *et al.*, 1997; Bannerman *et al.*, 1993), the simple method assumes a median urban runoff default value, derived from NURP data (Pitt, 1998), of 20,000 MPN/100ml. For more information on sources and pathways of bacteria in urban runoff, consult Schueler (1999).

The Simple Method estimates pollutant loads for chemical constituents as a product of annual runoff volume and pollutant concentration, as:

$$L = 0.266 \times R \times C \times A$$

Where: L = Annual load (lbs) R = Annual runoff (inches)
C = Pollutant concentration (mg/l)
A = Area (acres)
0.226 = Unit conversion factor

For bacteria, the equation is slightly different, to account for the differences in units. The modified equation for bacteria is:

$$L = 1.03 \times 10^{-3} \times R \times C \times A$$

---

[2] https://www.stormwatercenter.net/monitoring%20and%20assessment/simple%20meth/simple%20TSS%20table%201.htm
[3] https://www.stormwatercenter.net/monitoring%20and%20assessment/simple%20meth/simple%20TP%20table%202.htm
[4] https://www.stormwatercenter.net/monitoring%20and%20assessment/simple%20meth/simple%20TN%20table%203.htm
[5] https://www.stormwatercenter.net/monitoring%20and%20assessment/simple%20meth/simple%20table%204.htm

Where: L = Annual load (Billion Colonies)
R = Annual runoff (inches)
C = Bacteria concentration (#/100 ml)
A = Area (acres)
$1.03 * 10^{-3}$ = Unit conversion factor

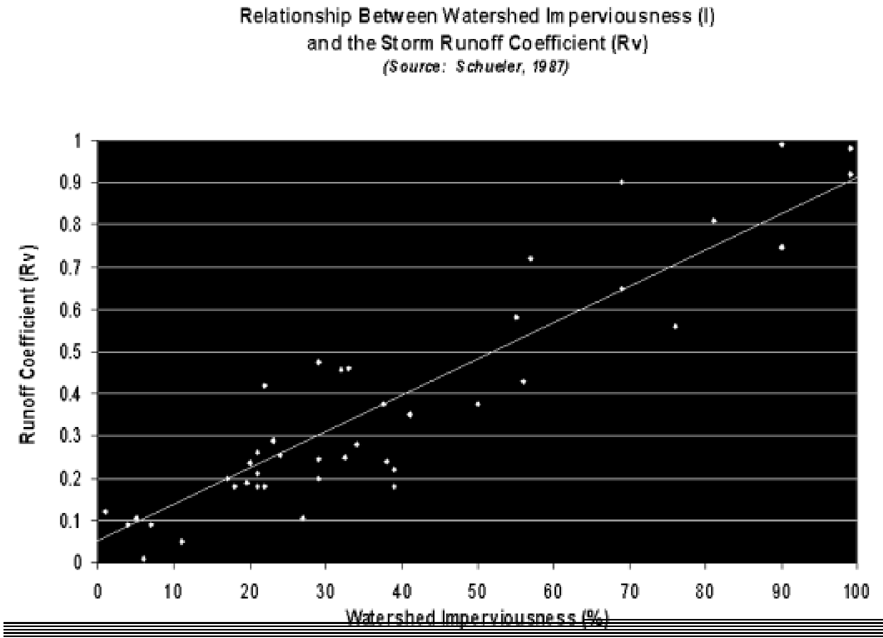
Annual Runoff

The Simple Method calculates annual runoff as a product of annual runoff volume, and a runoff coefficient (Rv). Runoff volume is calculated as:

$$R = P \times P_J \times Rv$$

Where: R = Annual runoff (inches)
P = Annual rainfall (inches)
P_j = Fraction of annual rainfall events that produce runoff (usually 0.9)
Rv = Runoff coefficient

In the Simple Method, the runoff coefficient is calculated based on impervious cover in the subwatershed. This relationship is shown in Figure 1. Although there is some scatter in the data, watershed imperviousness does appear to be a reasonable predictor of Rv.


Relationship Between Watershed Imperviousness (I)
and the Storm Runoff Coefficient (Rv)
(Source: Schueler, 1987)

The following equation represents the best fit line for the dataset (N=47, R^2=0.71).

$$Rv = 0.05 + 0.91Ia$$

Where: Ia = Impervious fraction

Impervious Cover Data

The model uses different impervious cover values for separate land uses within a subwatershed.

Representative impervious cover data, along with Model default values, are presented in Table 5.[6] A study is currently being conducted by the Center for Watershed Protection under a grant from the U.S. Environmental Protection Agency to update impervious cover estimates for these and other land uses. The results of this study will be available by 2001. In addition, some jurisdictions may have detailed impervious cover information if they maintain a detailed land use/land cover GIS database.

Limitations of the Simple Method

The Simple Method should provide reasonable estimates of changes in pollutant export resulting from urban development activities. However, several caveats should be kept in mind when applying this method.

The Simple Method is most appropriate for assessing and comparing the relative stormflow pollutant load changes of different land use and stormwater management scenarios. The Simple Method provides estimates of storm pollutant export that are probably close to the "true" but unknown value for a development site, catchment, or subwatershed. However, it is very important not to over emphasis the precision of the results obtained. For example, it would be inappropriate to use the Simple Method to evaluate relatively similar development scenarios (e.g., 34.3% versus 36.9% Impervious cover). The simple method provides a general planning estimate of likely storm pollutant export from areas at the scale of a development site, catchment or subwatershed. More sophisticated modeling may be needed to analyze larger and more complex watersheds.

In addition, the Simple Method only estimates pollutant loads generated during storm events. It does not consider pollutants associated with baseflow volume. Typically, baseflow is negligible or non-existent at the scale of a single development site, and can be safely neglected. However, catchments and subwatersheds do generate baseflow volume. Pollutant loads in baseflow are generally low and can seldom be distinguished from natural background levels (NVPDC, 1979). Consequently, baseflow pollutant loads normally constitute only a small fraction of the total pollutant load delivered from an urban area. Nevertheless, it is important to remember that the load estimates refer only to storm event derived loads and should not be confused with the total pollutant load from an area. This is particularly important when the development density of an area is low. For example, in a large low density residential subwatershed (Imp. Cover < 5%), as much as 75% of the annual runoff volume may occur as baseflow. In such a case, the annual baseflow nutrient load may be equivalent to the annual stormflow nutrient load.

References

Aqua Terra Consultants. 1994. *Chambers Watershed HSPF Calibration*. Prepared by D.C. Beyerlein and J.T. Brascher. Thurston County Storm and Surface Water Program. Thurston County, WA.

Bannerman, R.; D. Owens; R. Dodds and N. Hornewer. 1993. "Sources of Pollutants in Wisconsin Stormwater." *Water Science and Technology*. 28(3-5): 241-259.

Barrett, M. and J. Malina. 1998. "Comparison of Filtration Systems and Vegetated Controls for Stormwater Treatment." *3rd International Conference on Diffuse Pollution*: August 31- September 4, 1998. Scottish Environment Protection Agency. Edinburg, Scotland.

Caraco, D. and T. Schueler. 1999. "Stormwater Strategies for Arid and Semi-Arid Watersheds." Watershed Protection Techniques. 3(3): 695-706.

City of Olympia Public Works Department (COPWD). 1995. *Impervious Surface Reduction Study*. Olympia,

---

[6] https://www.stormwatercenter.net/monitoring%20and%20assessment/simple%20meth/simple%20imp%20table%205.htm

WA.

Claytor, R. and T. Schueler. 1996. *Design of Stormwater Filtering Systems*. Center for Watershed Protection. Ellicott City, MD.

Driscoll, E. 1986. Lognormality of Point and Non-Point Source Pollution Concentrations.

Engineering Foundation Conference: June 23-27, 1986. Proceedings. Published by the American Society of Civil Engineers. New York, NY.

Gibb, A., B. Bennett, and A. Birkbeck. 1991. *Urban Runoff Quality and Treatment: A Comprehensive Review*. British Columbia Research Corporation. Vancover, B.C.

Kluiteneberg, E. 1994. *Determination of Impervious Area and Directly Connected Impervious Area*. Memo for the Wayne County Rouge Program Office. Detroit, MI.

Northern Virginia Planning District Commission (NVPDC). 1980. *Guidebook for Screening Urban Nonpoint Pollution Management Strategies*. Northern Virginia Planning District Commission. Falls Church, VA.

Pitt, R. 1998. "Epidemiology and Stormwater Management." *Stormwater Quality Management*. CRC/Lewis Publishers. New York, NY.

Schueler, T. 1999. "Microbes and Urban Watersheds." *Watershed Protection Techniques*. 3(1): 551-596.

Schueler, T. 1987. Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban Best Management Practices. MWCOG. Washington, D.C.

Shelley, P., and D. Gaboury. "Estimation of Pollution from Highway Runoff - Initial Results." *Engineering Foundation Conference*: June 23-27, 1986. Proceedings. Published by the American Society of Civil Engineers. New York, NY.

Smullen, J., and K. Cave.1998. "Updating the U.S. Nationwide Urban Runoff Quality Database." *3rd International Conference on Diffuse Pollution*: August 31 - September 4, 1998. Scottish Environment Protection Agency. Edinburg, Scotland.

Steuer, J., W. Selbig, N. Hornewer, and J. Prey. 1997. "Sources of Contamination in an Urban Basin in Marquette, Michigan and an Analysis of Concentrations, Loads, and Data Quality." U.S. Geological Survey, *Water-Resources Investigations Report 97-4242.*

United States Department of Agriculture (USDA). Natural Resources Conservation Service (NRCS). 1986. *Technical Release 55: Urban Hydrology for Small Watersheds, 2nd Edition*. Washington, D.C.

United States Environmental Protection Agency. 1983. *Final Report. Results of the Nationwide Urban Runoff Project*. Washington, DC.

Whalen, P., and M. Cullum. 1989. An Assessment of Urban Land Use/Stormwater Runoff Quality Relationships and Treatment Efficiencies of Selected Stormwater Management Systems. South Florida Management District Resource Planning Department, Water Quality Division. Technical Publication 88-9.

Appendix C
Snow Storage Site Retrofit Monitoring Plan

This page intentionally left blank.

Table of Contents

C. Snow Storage Site Retrofit Monitoring Plan

1.0 Introduction

1.1 Background

The Municipality of Anchorage (MOA) has conducted a number of studies to assess deicer and snowmelt impacts on receiving waters. These assessments provide quantitative, site-specific local data. In addition, these assessments were informed by reference to the literature on similar research.

In 1998 the MOA sampled snowmelt at four snow storage sites (Commercial Drive, Tudor Road, Sitka Street, and Anchorage International Airport), each with snow hauled from different types of land uses (MOA, 1998). This study was specifically targeted to assess the potential for meltwater from snow storage sites containing magnesium chloride deicer to impact Anchorage surface and subsurface receiving waters.

As a follow-up to the 1998 study, in 1999 the MOA sampled snowmelt at two snow storage sites (North Mountain View and Tudor Road) to determine whether the 1998 data accurately represented chloride impacts from snow site meltwater (MOA, 1999). In addition, this study monitored chloride concentrations in snowmelt runoff from three street sites and in receiving waters. This study estimated concentrations of anions and cations in snowmelt from samples to estimate the relative proportion of chloride, magnesium, and sodium in meltwater and receiving waters.

In 1999 EPA issued a National Pollutant Discharges Elimination System (NPDES) stormwater discharge permit (AKS 052558) to the MOA and the Alaska Department of Transportation and Public Facilities (ADOT&PF). The permit required these co-permittees to assess the effects of street deicers on water quality and to require the use of Best Management Practices (BMPs) at snow storage sites. Based on the permit requirements and building on monitoring efforts in 1998 and 1999, the MOA conducted several more years of monitoring at snow storage sites.

In 2000 the MOA conducted a study that estimated snow mass in the snow pack at three Anchorage snow storage sites and assessed pollutant concentrations, including chloride and turbidity, in the snowmelt prior to settling or dilution in the detention basins (MOA, 2000b). In 2001 the MOA also conducted monitoring of snow storage site meltwater at the Tudor snow storage site.

Peak chloride and turbidity values from these past studies are summarized in Table C-1. Chloride concentrations were found to peak early in the monitoring period at approximately 400 mg/L at both the Tudor and Sitka Street snow storage sites in 2000 (MOA, 2000b) and at approximately 1,300 mg/L at the Tudor site in 2001 (MOA, 2001). Chloride concentrations at both sites diminished to less than half their peak concentrations within 4 to 10 days (MOA, 2000b and 2001). Flows from the sites peaked after peak chloride concentrations; and turbidity peaked toward the end of the melt period (MOA, 2001b).

The results of these studies show that the peak chloride concentration precedes the peak flow. This is thought to occur because of the high solubility of sodium and magnesium chloride.

Table C-1. Previous Sampling Results

Snow Site	Monitoring Location Description	Monitoring Site ID	Maximum Chloride Values		Maximum Turbidity Values
			From correlation with specific conductance	Based on laboratory analyses	Field Sampling Results
			mg/L	mg/L	NTU
2000					
South Anchorage	Meltwater discharger to wetlands from adjacent ponding, east-central side	SANC01A	338	349	5800
	Meltwater discharge to wetlands directly from snow mass - 10 ft north of east pond	SANC01B	333	not sampled	30
	Meltwater discharge to wetlands from snow mass - 30 ft north of east pond	SANC01C	190	not sampled	11
	Meltwater discharging from NE corner of site	SANC02	266	not sampled	299
	Meltwater discharging from northern side about 50 ft from NE corner	SANC03	216	not sampled	299
Sitka Street	Meltwater entering detention pond from snowmass before the fence	SI01	392	405	267
	Meltwater discharging by the entrance gate just prior to off-site discharge	SI02	187	158	50
	Detention pond discharge	SI03	195	not sampled	50
Tudor Road	Discharge from NW edge of snow site into detention basin	TU01	436	428	3500
	Discharge from north central portion of snow site into detention basin	TU02	202	349	337
	Discharge from Eastern edge of snow site into detention basin	TU03	226	333	353
2001					
Tudor Road	Discharge off NW edge of snow site into detention basin	TU01	1338	1160	761
	Discharge from pilot area V-swales	TU03	821	not sampled	8.1
2013					
Tudor Road	Discharge from NW edge of snow site	TU01	850	not sampled	550
	Discharge from pilot area V-swales	TU03	185	not sampled	65
Spruce Street	Meltwater from basin pond	SprWR1	50	not sampled	26
	Discharge from distributory weir	SprWR2	10	not sampled	23

Turbidity was found to follow the peak flow. This is thought to occur because the particulates are retained within the snow pack forming a crust on the snow which is the last to enter the discharge stream (MOA, 2000a). Based on these observations and literature information, the MOA proposed a treatment train of V-swales and detention basins as snow storage site BMPs.

In 2001, MOA studied the impact of a set of V-swales (also called V-pads) in a pilot area at the Tudor snow storage site. Installation of the pilot V-pad was intended to reduce turbidity in the snowmelt discharge. This assessment evaluated turbidity and chloride in the discharge over approximately six weeks of snowmelt and quantitatively assessed the effectiveness of the snow storage retrofit by measuring chloride and turbidity in the meltwater discharged prior to the detention pond (MOA, 2001). Study results (MOA, 2001) showed that turbidity in the discharge from the V-pad area of the snow storage site was reduced by an average of four times that of the standard practice storage area.

The NPDES stormwater permit issued in 2009 to MOA is now administered under the Alaska Pollutant Discharge Elimination System (APDES). It requires quantitative assessment of the effectiveness of two full-scale snow storage retrofits by measuring chloride and turbidity in the meltwater discharged from the snow storage sites.

This study will evaluate the effectiveness of the snow storage area BMPs (specifically the V-pads and detention basins) at reducing turbidity and chloride concentrations in snowmelt runoff leaving the snow storage sites. In addition to the control provided by the V-pads and detention basin BMPs, results of this study will also qualitatively reflect the effects of operational BMPs. These include changes in use of deicing chemicals in the source areas of snow destined for these sites and the placement of snow in these sites (including such considerations as sequencing of site fill, setbacks from berms, and height of the snow mass). The results of this study may also reflect season to season variability in snow filling operations due to the timing and amount of snowfall and application of sand and deicer in the Anchorage bowl.

1.2 Problem Definition

During the winter, MOA and ADOT&PF use de-icing and anti-icing agents that contain sodium and magnesium chloride to improve driving conditions. The salts mixed with traction aggregate applied to streets (to prevent clumping of the aggregate and to enhance bonding of the aggregate to snow and ice) and applied directly to Anchorage streets may be removed when snow is plowed and hauled to one of several snow storage sites within the Anchorage area. Data suggest that while most of the de-icing agents (sodium and magnesium chloride and aggregate) remain on or near the street application sites, a fraction of particulate and other street pollutants is incorporated into the stored snow (MOA 1998).

During spring thaw, the salts and particulates drain from the snow storage sites and may flow into local streams. Concern over the quality of the discharge from the snow storage sites resulted in the MOA retrofitting the snow storage sites at the Tudor Street snow storage site with windrows of V-shaped swales (or V-pads) for snow placement and detention basin. The pilot study of the Tudor site (MOA, 2001) indicated water quality improvements, specifically in reduced turbidity of the snowmelt discharge.

This study seeks to quantify changes in chloride and turbidity in meltwater discharged from retrofitted or newly designed MOA and ADOT&PF-owned or operated snow storage sites to determine whether the BMPs reduce turbidity and chloride concentrations that are discharged to the receiving waters.

1.3 Goals and Objectives

The goal of this monitoring plan is to evaluate two snow storage areas to determine the effectiveness of the BMPs at reducing chloride and turbidity in the snowmelt runoff. Specific objectives are to measure specific conductance (as a surrogate for chloride) turbidity, and flow of the snowmelt discharged at two snow storage areas that have been constructed or retrofitted with V-pads and detention ponds. This data will be used to determine whether the BMPs reduce turbidity and chloride concentrations when compared to data gathered from non retrofit sites.

2.0 Description of Program and Rationale

2.1 Sampling Design

MOA will monitor the discharge of snowmelt at two snow storage sites that have been retrofitted with BMPs. The locations of the two sites, the Tudor Road and Spruce Street snow storage sites, are depicted in Figures C-2 and C-3. If MOA identifies an alternative site for either of these, the site will have equivalent BMPs and sampling regime.

The Tudor snow storage site is located southwest of the intersection of Tudor Road and Campbell Air Strip Road. The site has a relatively high slope and historically turbid meltwater (MOA, 2000b). The Tudor site meltwater discharges into an unnamed branch of Chester Creek.

The Spruce Street snow storage facility is located south of Dowling Road on between Elmore Road and Spruce Street.

Two types of BMPs have been installed at the Tudor site. The first is an expansion of the pilot study V-swales that now encompass the entire area where snow is placed in windrows. As the snowmelts, particulates that cause turbidity are retained within the swales. The V-pad discharges into the second BMP, a detention pond, which further removes solids by settling and serves to ameliorate the peak chloride concentrations.

The Spruce Street site was constructed in 2012 with V-swale technology on the snow pad and a retention pond to receive melt water from the entire snow storage site. The pond discharges through a weir into a second small settling pond before it is dispersed into an adjacent wetland.

During all sampling events, MOA will monitor flow using the volumetric method, and specific conductance and turbidity at select stations, shown in Figures C-2 and C-3. Measurements will be taken using a YSI 556 to measure specific conductance as a surrogate for chloride concentration and a Hach 2100P for directly measuring nephelometric turbidity.

To determine the effectiveness of the V-pad BMP at retaining particulates, MOA will monitor turbidity at representative V-pad outlets at the two snow storage sites. For the Tudor site, turbidity measurements will be compared to the data obtained in 2001 and 2013 at that site (MOA, 2001 and 2013). For the Spruce Street Station site, turbidity data obtained at the V-pad outlets will be compared with the data gathered from the 2013 study MOA, 2013). Turbidity will also be monitored as it discharges from the detention ponds. MOA will monitor turbidity by obtaining a minimum of weekly grab samples.

To determine the effectiveness of the detention ponds at ameliorating chloride concentrations, the V-pad outlets and the discharge from each pond will be monitored for specific conductance (a surrogate for chloride) and flow depth over a weir. The V-pad outlets will be monitored for specific conductance and flow to establish chloride concentrations and flow entering the detention ponds.

Flow depth will be monitored at flow points where samples are taken. Existing weirs will be used where available and in good condition. Where needed, temporary weirs will be installed at the sampling locations. The appropriate equations for the chosen weir configuration will be applied to obtain either continuous or instantaneous flow records.

2.2 Schedule of Sampling

MOA will obtain daily or weekly grab samples during afternoon for field and laboratory analysis.

Figure C-1

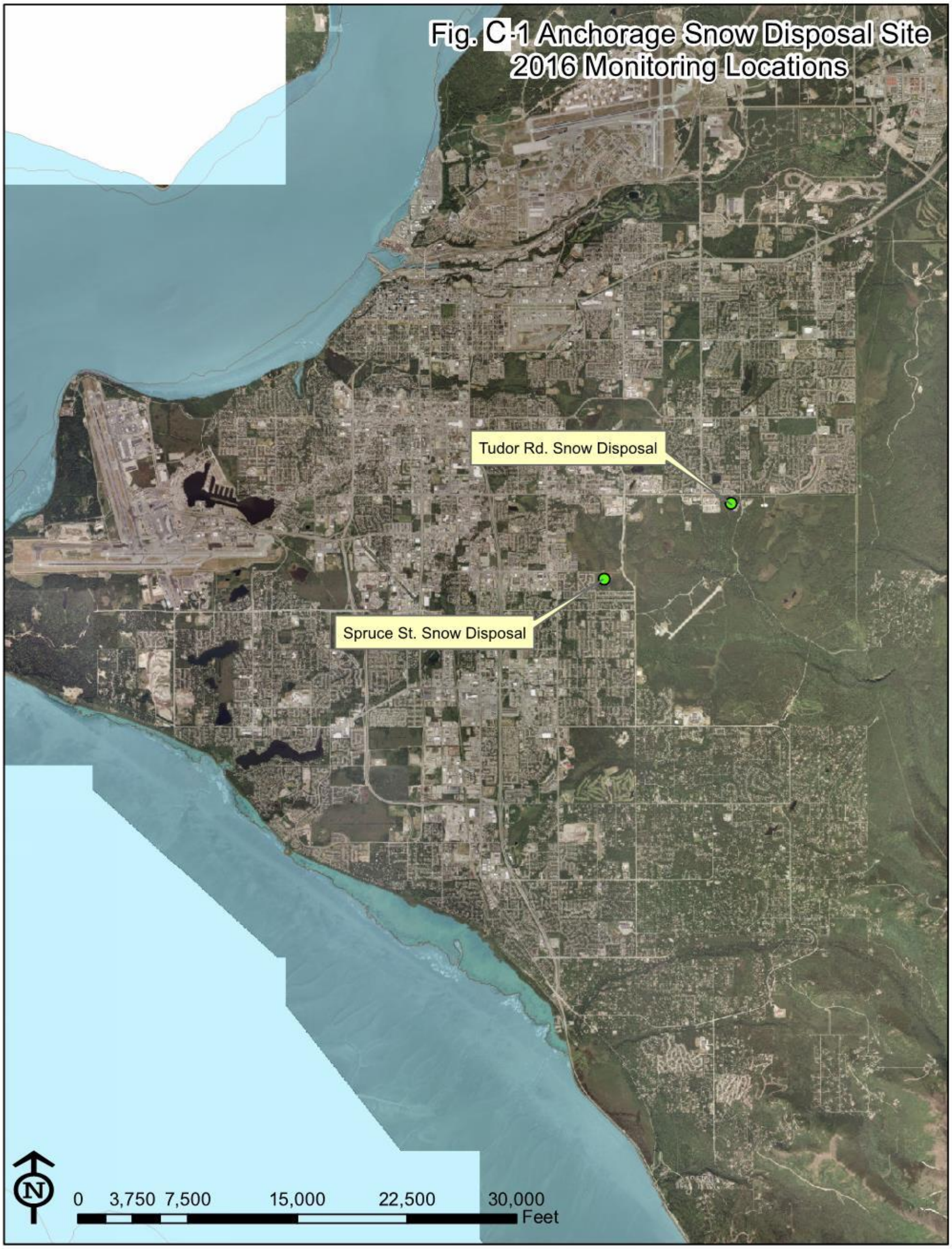


Fig. C-1 Anchorage Snow Disposal Site
2016 Monitoring Locations
Tudor Rd. Snow Disposal
Spruce St. Snow Disposal
N
0 3,750 7,500 15,000 22,500 30,000
Feet

Figure C-2

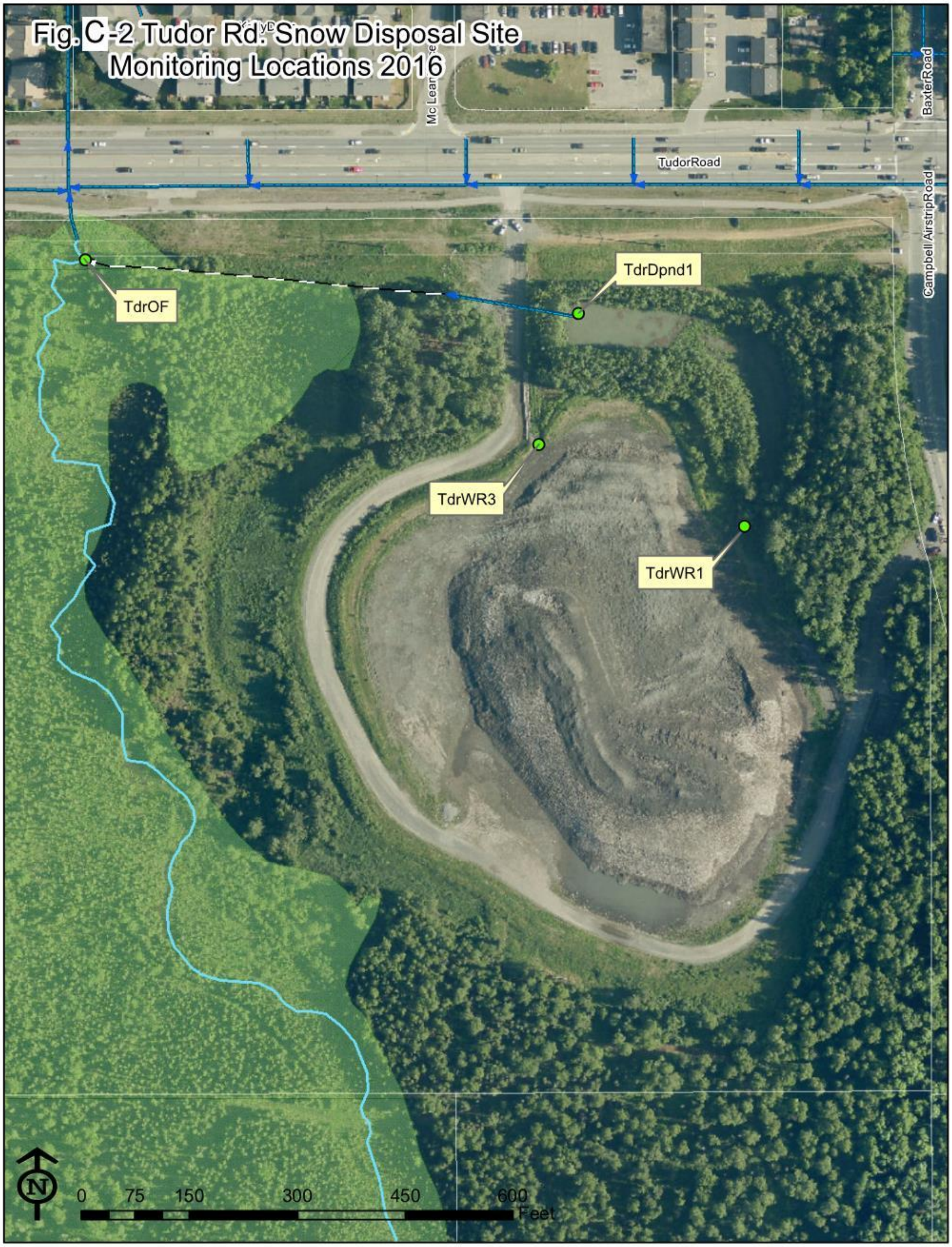


Fig. C-2 Tudor Rd. Snow Disposal Site
Monitoring Locations 2016
Mc Lean
BaxterRoad
TudorRoad
Campbell AirstripRoad
TdrDpnd1
TdrOF
TdrWR3
TdrWR1
N
0
75
150
300
450
600
Feet

3.0 Monitoring Locations

Runoff from Tudor snow storage site flows to the pond through three outlets depicted on Figure C-2 as TU01, TU02, and TU08 for the Tudor Road site. The discharge from the detention ponds will be monitored at TU04

Monitoring from Spruce Street snow site flows into the pond depicted on Figure C-3 as SprWR1 and east through a distributory weir labeled SprWR2 into an adjacent wetland.

For each of the monitoring locations, Table C-2 summarizes the purpose of monitoring and criteria for selection of the specific sites.

Table C-2. Sampling Site Representativeness

Site ID	Monitoring Purpose	Criteria for Site Selection
TU01	Characterize snowmelt quality after V-swales but before pond	Downstream of V-swales, and upstream of pond
TU02	Characterize snowmelt quality after V-swales but before pond	Downstream of V-swales, and upstream of pond
TU04	Characterize snowmelt quality after pond treatment	Downstream of pond
SprWR1	Characterize snowmelt quality after V-swales but before pond	Downstream of V-swales, and upstream of pond
SprWR2	Characterize snowmelt quality after pond treatment at distributory weir	Downstream of V-swales and pond

Figure C-3

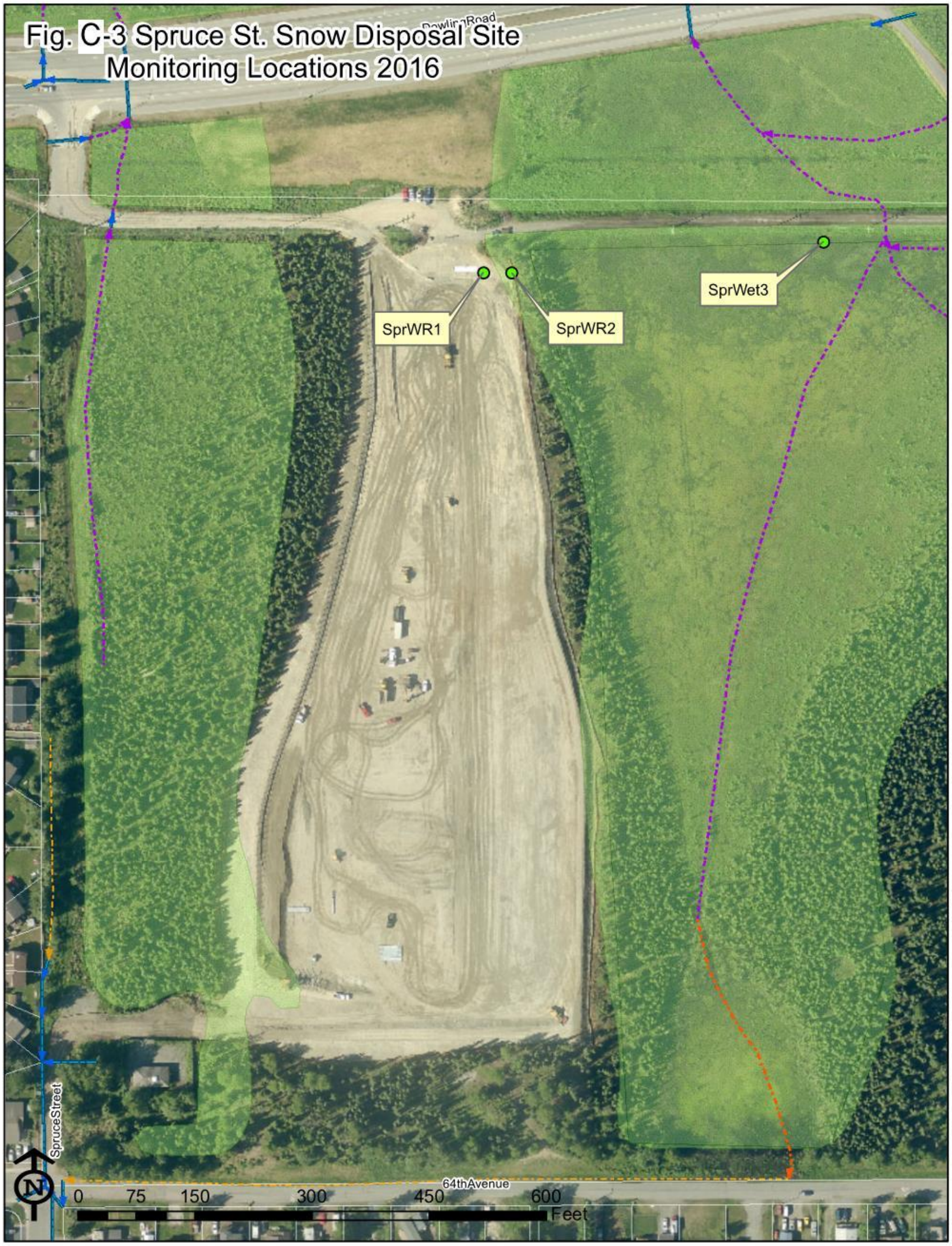


Fig. C-3 Spruce St. Snow Disposal Site
Monitoring Locations 2016
DowlingRoad
SprWR1
SprWR2
SprWet3
SpruceStreet
64thAvenue
N
0
75
150
300
450
600
Feet

4.0 Parameters to be Measured and Methods

Table C-3 summarizes the samples that will be taken at each location, and Table D-4 lists the parameters that will be monitored at each sample location, the sample types, frequencies, and times at which samples will be obtained and the total number of measurements that will be compiled from the sampling efforts.

Method detection limits, practical quantitation limits, and precision, accuracy, and completeness criteria are summarized in Table C-4 and provided in the Quality Assurance Project Plan (QAP).

A weir, coupled with a pressure transducer and data logger, will be installed at the outlet of the detention pond in order to determine flow discharging from the snow storage site. Based on previous data (MOA, 2000 and 2001) flows are anticipated to range from 0 to approximately 0.8 cfs. The flow will be calculated based on water depth over the specific weir as measured by a HOBO water level data logger (model U20-001-04) or equivalent.

Table C-3. Sampling Summary

	Flow	Specific Conductance	Turbidity	Chloride*
Site ID	Instantaneous	Grab	Grab	Grab
TU01	X	X	X	
TU02	X	X	X	
TU08	X	X	X	
TU04	X	X	X	X
SprWR1	X	X	X	
SprWR2	X	X	X	X

*minimum one lab sample per month to correlate specific conductance data

Table C-4. Site Sampling Schedule

Site ID	Monitored Parameters	Type of Sample	Frequency	Sample Time	Total No. of Measurements
TU01	Specific conductance, flow stage	C	Continuously	Continuous (4 per hour)	~6,000
	Specific conductance, Chloride	G	1 - 2 times/week	Between 2 and 3:30 pm	5
	Turbidity	G	Daily	Between 2 and 3:30 pm	~45
TU02	Specific conductance, flow stage (staff gage)	G, I	Daily	Between 2 and 3:30 pm	~45
	Turbidity	G	Daily	Between 2 and 3:30 pm	~45
TU08	Specific conductance, flow stage (staff gage)	G, I	Daily	Between 2 and 3:30 pm	~45
	Turbidity	G	Daily	Between 2 and 3:30 pm	~45
TU04	Specific conductance, flow stage	C	Continuously	Continuous (4 per hour)	~6,000
	Specific conductance, Chloride	G	1 - 2 times/week	Between 2 and 3:30 pm	5
	Turbidity	G	Daily	Between 2 and 3:30 pm	~45
KS01	Specific conductance, flow stage	C	Continuously	Continuous (4 per hour)	~6,000
	Specific conductance, Chloride	G	1 - 2 times/week	Between 2 and 3:30 pm	5
	Turbidity	G	Daily	Between 2 and 3:30 pm	~45
KS02	Specific conductance, flow stage (staff gage)	G, I	Daily	Between 2 and 3:30 pm	~45
	Turbidity	G	Daily	Between 2 and 3:30 pm	~45
KS03	Specific conductance, flow stage (staff gage)	G, I	Daily	Between 2 and 3:30 pm	~45
	Turbidity	G	Daily	Between 2 and 3:30 pm	~45
KS04	Specific conductance, flow stage	C	Continuously	Continuous (4 per hour)	~6,000
	Specific conductance, Chloride	G	1 - 2 times/week	Between 2 and 3:30 pm	5
	Turbidity	G	Daily	Between 2 and 3:30 pm	~45

C = Continuous monitoring: I = In-situ measurement (staff gage); G = Grab sample

5.0 Sampling Methods

5.1 Site-Specific Sample Methods, Handling, and Field QC

Grab samples for turbidity, specific conductance, and chloride will be collected each day in the afternoon when diurnal flow is the greatest. The specific conductance meter will be checked against certified calibration solutions prior to use. The field crews will also record flow (either by weir stage or the volumetric method) at each of the monitoring locations.

After ensuring that the flow monitoring and specific conductance meters are functioning, the water samples will be collected using a grab sampler from the water flowing over the weir to represent the discharge. This is accomplished by holding the grab sampler below the flowing water. If no water is flowing over the weir, a sample will be taken just behind the weir by submerging the bottle beneath the water surface and pulling upward through the water column. Sample crews should take care not to disturb any sediment accumulated behind the weir when collecting a water sample. Field equipment will be used to measure turbidity and specific conductance. When chloride samples are taken, the sample crew will measure specific conductance from a field instrument at the same time. They will fill the laboratory bottle for chloride first. Water will be reserved in the grab samples for the field crew to use in measuring turbidity. Field measurements will be recorded in the field log book.

5.2 Site-specific, Non-Direct Measurements

Observations of operational BMPs will be recorded at the time of sampling startup. Observations include: placement of snow including sequencing of site fill, height of the snow mass and any other relevant information available.

5.3 Sample Preservation and Packing

The turbidity and specific conductance measurements will be recorded in the field, eliminating the need for preservation and packing.

The chloride samples from each site will be collected, preserved, and packed for shipment to the laboratory as described in the QAPP.

5.3.1 Chain of Custody

Use and completion of the chain of custody forms is provided in Appendix G of the QAPP.

5.4 Field Instrument Calibration

Instrument calibration is addressed in Appendix H of the QAPP. Each field instrument will be calibrated according to the manufacturer's directions and records of calibrations will be maintained in the project-specific field log book. Stage height will be recorded using commercially available staff gages calibrated to the hundredth of a foot.

6.0 Training

Each field crew member must be trained in the following prior to conducting field work:

- Field safety
- Sampling protocols
- Calibration and operation of turbidimeter and specific conductance meter Proper recording of data in field log book
- Field quality control samples Sample preservation and packaging Chain of custody completion Familiarity with laboratory location.

Before field crew members are allowed to conduct reportable work, they must demonstrate competence in conducting field analyses. A tenured field crew will ensure that new field crews are competent in all field procedures and test protocols.

7.0 Report

MOA will prepare a brief report following each of the sampling seasons at the two snow storage sites that will be appended to the annual APDES report. The report will include a description of the sampling events, field and laboratory results, a discussion of the results, quality control/quality assurance reporting, and any recommended changes to the protocols for future sampling events. In discussing the results, MOA will:

- Develop a correlation between the laboratory chloride data and the specific conductance for each site and use the equation to estimate chloride concentrations obtained at the monitoring points.

- Provide the weir equation(s) that relate stage height with flow rate, if applicable.

- Compare the peak chloride concentrations and turbidity to previous results. For the Tudor site, the comparisons will be made with those reported in the data reports from 2000 and 2001 (MOA, 2000b and 2001). For the Spruce Street site, data will be compared to data from the 2013 effort as well as the Tudor monitoring effort. The reports will also discuss similarities and postulate reasons for possible differences.

8.0 References

MOA. 1998. Magnesium Chloride Deicer in Snow Disposal Sites at Anchorage, Alaska: Assessment Design. Prepared by Scott Wheaton, Watershed Scientist, WMS. Prepared for Watershed Management Section, Municipality of Anchorage. March 1998.Document No. WMP APd 98001.

MOA. 1999. Meltwater Runoff from Anchorage Streets and Snow Disposal: 1999 Data Report.

Prepared by Montgomery Watson. Prepared for Watershed Management Section, Municipality of Anchorage. October 1999. Document No. WMP APr 99003.

MOA. 2000a. Anchorage Street Deicer and Snow Disposal: 2000 Design Report. Prepared by MWH. Prepared for Watershed Management Section (WMS), Municipality of Anchorage. December 2000. Document No. WMP APd00004.

MOA. 2001. Anchorage Street Deicer and Snow Disposal: 2001 Data Report. Prepared by MWH. Prepared for Watershed Management Section (WMS), Municipality of Anchorage. October 2000. Document No. WMP APr01004.

MOA. 2000b. Anchorage Street Deicer and Snow Disposal: 2000 Data Report. Prepared by MWH. Prepared for Watershed Management Section (WMS), Municipality of Anchorage. December 2000. Document No. WMP APr00004.

MOA. 2013. Anchorage Snow Disposal Sites: 2013 Evaluation. Prepared by Watershed Management Services, Municipality Of Anchorage. January 2014. Document No. WMP ARr14002

This page intentionally left blank.

Appendix D
Low Impact Development Demonstration Project Monitoring Plan

This page intentionally left blank.

Table of Contents

D. Low Impact Development Demonstration Project Monitoring Plan

1.0 Introduction

1.1 Background

In 1999 the U.S. Environmental Protection Agency (EPA) issued the Municipality of Anchorage (MOA) and the Alaska Department of Transportation and Public Facilities (ADOT&PF) a Municipal Separate Storm Sewer System (MS4) permit under the National Pollutant Discharge Elimination System (NPDES) in 1999. In 2009, the permit became administered under the Alaska Pollutant Discharge Elimination System (APDES), and the Alaska Department of Environmental Conservation (ADEC) issued the APDES permit (AKS052558), wherein Section II.B.2.c requires the MOA to install five demonstration projects that use low impact development (LID) techniques for on-site stormwater management. The ADEC re-issued the permit in October 2015 without changes to this requirement (Section 3.2.3). The permit directs the MOA to evaluate the performance of each demonstration project and include an evaluation report with the fourth year Annual Report (due February 2019).

1.2 Problem Definition

Uncontrolled runoff from impervious surfaces can adversely affect receiving water bodies if the tools used to manage stormwater focus solely on hard infrastructure and end-of-pipe controls (EPA, 2009). The National Research Council’s 2008 report entitled *Urban Stormwater Management in the Untied States* recognized that stormwater control measures that harvest, infiltrate, and evapotranspire stormwater are critical to reducing the volume and pollutant loading from small storms. “Green infrastructure,” also called low impact development (LID), uses soil, trees, vegetation, wetlands, and open space to capture stormwater and enhance its treatment. LID techniques are more aesthetic, sustainable, and environmentally friendly than the more traditional infrastructure solutions aimed at rapid removal.

To assist MOA in its development of a comprehensive stormwater program, the EPA-issued permit requires the MOA and ADOT to implement and evaluate five LID demonstration projects with three being ADOT owned. The five projects are subject to the following permit conditions:

- All of the demonstration projects must manage the runoff from at least 10,000 square feet of impervious surface.
- At least two of the projects must address drainage areas greater than five acres.
- One demonstration project must be located in the Chester, Campbell, Fish, or Little Campbell Creek watersheds.
- One of the demonstration project rain gardens must be located in any of the following: neighborhoods, parking lots or public-private community partnership. If feasible, demonstration projects should be located within a TMDL watershed listed in Table 2 of the permit.

- At least one public facility parking lot must be retrofitted with infiltration, evapotranspiration, or reuse techniques designed to treat 100% of the parking lot runoff from the 90th percentile, 24 hour rainfall event.

This monitoring plan is designed to predict and monitor the quantity of stormwater discharged from the LID demonstration projects pursuant to the APDES permit obligations.

In addition to monitoring stormwater discharge from LID demonstration projects monitoring will be conducted on at least two control measures implemented during this permit term to assess the effectiveness in reducing fecal coliform and petroleum products. LID projects as well as stormwater controls will be considered for this additional monitoring. Additional sampling requirements are discussed in Section 4.2 of this Appendix.

1.3 Goals and Objectives

One goal of the MOA's comprehensive stormwater program and the LID demonstration projects is to reduce stormwater volume discharged to receiving water bodies by reducing total stormwater runoff volumes from both newly developed projects and retrofitting of existing project areas. The LID demonstration project monitoring efforts will compare pre LID (actual or model-generated) peak flow, volume, and duration runoff to post LID measured values. As directed by the permit:

- For retrofit projects, the MOA will monitor changes in runoff quantities, before and after implementation of the LID projects
- For new construction projects, the MOA will calculate changes in runoff quantities comparing theoretical non LID runoff with actual monitored LID runoff after construction.

For both retrofit and new construction projects, MOA will measure runoff flow rates with a 20% or less margin of error and will prepare runoff hydrographs to characterize peak runoff rates and volumes, discharge rates and volumes, and duration of discharge volumes. The outcome of this monitoring effort will be used to evaluate the overall effectiveness of the LID features installed, develop recommendations for future LID practices, and to update the final LID criteria in the Storm Water Design Criteria Manual.

2.0 Description of Program and Rationale

Monitoring the hydraulic effectiveness of LID is challenging because LID principally seeks to attenuate peak flows, disperse runoff and minimize velocities. The use of hydraulic modeling makes it possible to estimate flows that could not be accurately measured based on the contributing area characteristics, local rainfall patterns, and LID facility configuration. This program will pair modeling and monitoring data to 1) select appropriate monitoring equipment, 2) characterize the full water balance, and 3) evaluate the post-construction performance of each LID feature.

Although the five LID features to be evaluated have not yet been identified, this monitoring plan assumes that they will consist of bioretention facilities (i.e., rain gardens and/or bioretention swales) with varying configurations of inflow, overflow, and possibly underdrain pipes. The designs for those features will need to explicitly account for monitoring in the construction plans.

Furthermore, the final monitoring plans to be developed by MOA will vary based on the specific design and installation at each site.

2.1 Sampling Design

The first step in developing a sampling design for each site is to review the design report to determine the design flows that were used. The configuration and design flows for each site will inform the selection of monitoring equipment, especially where specialized equipment may be needed for low flows.

For each LID feature, where inflow and/or outflow structures are present and stage-discharge relationships can be established, flows will be directly monitored. Pressure transducers are commonly used in these applications to continuously monitor stage over a structure with a calculated or known stage-discharge curve. The pressure transducers are commonly installed in a stilling well above the hydraulic control structure. All manufacturer's recommendations will be followed.

If direct instrumentation of the facility is not possible, hydraulic modeling will be performed to simulate those flows, as discussed in Section 2.2

General considerations for the final sampling plans to be developed by MOA for each site include:

- Recommendations for monitoring in the final construction plans for each site to facilitate monitoring.
- Monitoring designs that protect against vandalism (i.e., fences, manhole covers locking covers, etc.)
- Location of rain gage as close to the LID feature as possible within the same watershed, while not disrupting use of the site and with as little interference as possible from buildings, overhangs, landscaping and trees, wind, or other factors that may affect accurate readings. The rain gage must be protected from vandalism.
- Location of pressure transducers in sumps or stilling structures, such as manholes, catch basins, and/or stilling wells with corresponding mathematical relationship to calculate flow from recorded depths.
- Location of monitoring equipment to minimize confined space entry requirements.

2.2 Hydraulic Modeling

Where monitoring of inflows is infeasible the Stormwater Management Model Version 5.1.010 (SWMM5 LID) will be used to simulate those inflows.

2.2.1 Modeling of LID Facilities

Inflows to the LID facilities will be modeled based on the characteristics of the contributing drainage areas (i.e., soils, vegetation, slopes, and land use), stormwater conveyance pipe network, local rainfall data, and evaporative losses. The Green-Ampt approach for estimating overland infiltration will be used. Green-Ampt considers the effects of a sharp wetting front moving through the soil column on the capacity of the soil to infiltrate stormwater runoff. Overland infiltration is defined as the infiltration that occurs across the subbasin, before stormwater runoff would enter a LID facility, as opposed to the infiltration that may occur within the LID facility itself through the bottom and/or side slopes. Section 5.1.2 describes the rainfall data to be input to the models. Hydraulic modeling will be performed using a 5-minute time step, and hydraulic modeling will be performed using a maximum 1-minute time step. These small time steps will allow for accurately estimating peak flow intensities into the LID facilities. The simulation time period will match the monitoring period, as described Section 2.3.

As described previously, outflows will be monitored where possible. Outflows may include surface overflows and/or underdrains, dependent on the facility configuration. Where monitoring outflows is unfeasible, the outflows will also be estimated through the use of appropriate physical equations using hydrologic modeling software, as described above, or an analogous spreadsheet tool.

2.2.2 Modeling of Baseline Conditions

The permit defines the baseline conditions that must be compared with the monitoring data for retrofit and new construction sites (See Section 3.2.3.2). For retrofit projects, changes in runoff quantities shall be calculated as a percentage of 100% pervious surface before and after implementation of the LID practices. For new construction projects, the permit defines the baseline condition to be the developed project site without mitigation from LID facilities. The SWMM5 LID model will be used to simulate those baseline conditions for each site for purposes of comparing mitigated and unmitigated runoff conditions in accordance with the permit.

In addition to meeting the permit requirements, the model will be used to simulate the following additional baseline conditions for further evaluation of LID facility performance:

- For smaller sites (i.e., in the range of 10,000 square feet), the model will be used to simulate runoff from an assumed 100 percent impervious coverage.
- For larger sites (i.e., 5 acres or greater), the model will be used to simulate runoff from the actual land use breakdown that exists at the site, but with no LID facilities.

These additional baseline conditions are similar to the permit requirements, but are based on the size of the contributing area, rather than whether the project is a retrofit or new construction.

2.2.3 Modeling Results

The results of the modeling will be coupled with the monitored records, statistically evaluated and graphed for, stage, flow, peak flows, volume and reductions achieved by each LID facility. Scatter plots or histograms may be developed to graphically illustrate the frequency of rainfall and discharge events (Geosyntec, 2009). This will allow visualization of threshold discharge as a function of rainfall depth or inflow.

2.3 Schedule of Flow Monitoring

Monitoring schedules for each facility will be determined based on the facilities characteristics. Most facilities are subject to freeze up which can both damage monitoring equipment and render soils impervious. As a general rule, rain gages and stage monitoring equipment will be deployed after the danger of freezing has passed in the spring and before it retunes in the fall. This commonly equates to a May through mid October monitoring season.

3.0 Monitoring Locations

The specific LID demonstration projects and their locations are determined based on funding, project concurrence, and opportunities. Specific sites will be identified throughout the permit period.

Prior to the sampling season chosen for each demonstration project, the monitoring locations will be identified, and maps submitted as an addendum to the monitoring plan.

4.0 Sampling Methods

4.1 Site-Specific Sample Methods, Handling, and Field QC

MOA will install project specific instrumentation at each of the sites in the spring, download data and check equipment function and calibration on a bi-weekly basis, and removed it in the fall. Monitoring data will be quality checked and statistically corrected for data anomalies and instrument drift using standard practices.

4.1.1 Precipitation Records

Precipitation will be recorded using a tipping bucket rain gage and data logger recording in 0.01 inch increments. The rain gages will be located as close to the LID feature as possible in a secure location, such as the roof of a building. During precipitation events the collection cup in the gage collects precipitation until it reaches the equivalent of 0.01 inches where upon the bucket tips, triggering a reed switch and recording an event with a time stamp. These events are stored in the data logger and downloaded into a computer program where they can be summarized over different time intervals or graphed over time to produce a hyetograph. Data will be downloaded monthly. For each 24-hour storm event, the total 24-hour precipitation, beginning and ending time, and date of each storm event are used to generate a hyetograph d from the collected data.

4.2 Water Quality Sampling

Section 4.1.2 of the APDES permit requires that at least two control measures implemented through this permit cycle be assessed for effectiveness in reducing fecal coliform and petroleum products. Monitoring of the systems will provide the MOA with information to: 1) evaluate local effectiveness of pollutant removal by the BMPs; 2) develop improved guidance for design and maintenance practices; and 3) provide guidance in identifying the applicability of use these types of BMPs at various Anchorage MS4 locations. The sampling design has the potential to vary substantially between different LID features; therefore the site specific sampling design and quality assurance procedures will be developed when the LID feature has been identified for monitoring. Site selection will include the following criteria:

- Site accessibility and sampling safety issues
- Underdrain or discharge access

- Available engineering/as-built design drawings
- Potential for inflows to contain petroleum products or fecal coliform based upon drainage area land uses
- Number of inlets and outlets
- Types of inlet and outlets (pipe, weir, sheet flow)
- Shallow groundwater assessment
- Short residence time

Generally, samples will be collected from water entering the control system and from surface water discharging the system and entering a stream or lake. Samples will be collected for fecal coliform, TAH, and TAqH and submitted for laboratory analysis. Sample timing will be contingent upon contribution area and control feature hydraulics.

4.3 Field Instrument Calibration

Instrument calibration will be conducted in accordance with the specific manufacture's manuals for the equipment installed.

Tipping bucket rain gages are calibrated by the manufacturer prior to field deployment and require no additional calibration. Weirs and installed staff gages will be calibrated at installation. The field crew will check calibration against visual stage height prior to a predicted storm event.

5.0 Training

Each field crew member must complete the following training prior to conducting field work:

- Field safety
- Proper installation of pressure transducers, data loggers, and rain gages
- Proper downloading of field recording data.

Before field crew members are allowed to do reportable work, they must demonstrate competence in conducting field analyses. A tenured field crew will ensure that new field crews are competent in all field procedures and test protocols.

6.0 Report

MOA will prepare a report presenting the results from the demonstration studies that will include a description of each of the LID features that were monitored; measured and modeled inflows and outflows and monitored stage time series for each LID facility. The report should also present recommendations for changes to the LID design requirements in the Storm Water Design Criteria Manual based on findings from the performance evaluations. The results section of the report will include the following for each LID facility:

- For smaller sites (i.e., approximately 10,000 square feet), comparison of LID facility outflows (overflow plus underdrain discharge, if applicable) with modeled runoff for a hypothetical 100% impervious, unmitigated site.

- For larger sites (i.e., 5 acres or greater), comparison of LID facility outflows (overflows plus underdrain discharge, if applicable) with runoff for a hypothetical unmitigated condition for the same-size site with the actual land use distribution for that site.
- Runoff and stage hydrographs to characterize peak flow, volume, and flow duration reductions, as well as ponding levels and drawdown times, as compared with observed rainfall intensities.

Inflow, stage, and outflow hydrographs will be developed for each LID facility for the full monitoring period. Rainfall will be plotted on the secondary x-axis for each hydrograph for direct comparison of rainfall intensity and volume with LID facility performance. Summary statistics, including maximum surface ponding drawdown times and reduction in peak flow rates, volume, and duration of flows will be included in a note on the hydrographs.

7.0 References

EPA. 2009. Fact Sheet Prepared by the US Environmental Protection Agency for reissuance of the National Pollutant Discharge Elimination System (NPDES) permit for the Municipality of Anchorage and the Alaska Department of Transportation and public Facilities. Permit number AKS-052558. July 2009.

Geosyntec Consultants and Wright Water Engineers. 2009. Urban Stormwater BMP Performance Monitoring. International Stormwater Best Management Practices Database Project. http://www.bmpdatabase.org/ Prepared with support from USEPA, Water Environmental Research Foundation, Federal Highway Administration, Environmental and Water Resources Institute of the America Society of Civil Engineers. October 2009.

National Research Council. 2008. Urban Stormwater Management in the United States. The National Academies Press, Washington, D.C.

Appendix E

Dry Weather Screening Monitoring Plan

Table of Contents

Tables

Attachments

1.0 Introduction

1.1. Background

The U.S. Environmental Protection Agency (EPA) issued the Municipality of Anchorage (MOA) and the Alaska Department of Transportation and Public Facilities (ADOT&PF) a Municipal Separate Storm Sewer System (MS4) permit under the National Pollutant Discharge Elimination System (NPDES) in 1999. To meet the requirements of the permit, the MOA Watershed Management Services (WMS) initiated a dry weather screening (DWS) program in 1999 to identify and eliminate illicit discharges and associated pollutants to the MS4.

The EPA reissued the permit in 2009 prior to the State of Alaska receiving primacy to operate the NPDES program. The re-issued permit became effective February 1, 2010, under the administration of the Alaska Department of Environmental Conservation (ADEC) as an Alaska Pollutant Discharge Elimination System (APDES) MS4 permit. The APDES permit continued the requirement of dry weather screening. ADEC reissued APDES permit No. AKS052558, with revisions, on August 1, 2015, and August 1, 2020. The expiration date of the current permit is July 21, 2025.

MOA WMS has conducted the DWS program each year during the dry season since 1999. This monitoring plan updates the DWS program methodology per the conditions and requirements of the current permit.

1.2. Problem Definition

Dry weather screening is conducted to identify illicit discharges to the MS4. An illicit discharge is defined as any discharge to the MS4 that is not entirely composed of stormwater.[1] Illicit discharges, such as those from industrial process wastewater, domestic wastewater, car wash water, and other sources, can inadvertently introduce pollutants both directly and indirectly to the storm sewer system and receiving waters. Sources of illicit discharges are often intermittent or mobile, yet the frequency or severity of such discharges can have lasting effects on water quality in receiving waters.

Identification is the first step to eliminating these illicit discharges. Flow from storm drains during dry weather in most municipalities is an indicator of improper discharges to the storm system. In Anchorage, flow from outfalls during dry weather is frequently an indicator of groundwater infiltrating into the storm pipe rather than illicit discharges or illegal connections to the MS4. Field screening techniques are used to gather baseline information and identify highly suspect outfalls or obvious discharges.

Indicator monitoring can confirm the presence or origin of an illicit discharge. The *Illicit Discharge Detection and Elimination* guidance manual identifies 15 indicator parameters, noting that generally only three to five of these parameters need to be used to characterize the discharge for subsequent identification and elimination (CWP and Pitt 2004). Analytical methods are used to determine the presence of indicator parameters in illicit discharges.

The MOA must survey a minimum of 30 outfalls a year for illicit discharges that are geographically dispersed across the MS4 and must represent all major land uses and areas in the MS4. When flows are present in outfalls screening for seven parameters: pH, total chlorine, detergents as surfactants, total copper, total phenols, fecal coliform bacteria, and turbidity. Threshold exceedances are used to trigger

---

[1] Exceptions to this definition, such as discharges from firefighting activities and certain types of *de minimis* discharges, are listed in Part 1.4.1 of the APDES permit.

further action and provide information that will support that action. Thresholds are not necessarily based on exceedances of water quality standards.

1.3. Goals and Objectives

The goal of the MOA's illicit discharge management program is to reduce to the maximum extent practicable the unauthorized and illegal discharge of pollutants to the MS4.

The objective of this DWS program is to conduct frequent, geographically widespread monitoring to detect and investigate potential illicit discharges and illegal connections to the MS4.

2.0 Description of Program and Rationale

2.1. Sampling Design

The MOA's DWS program methodology was established in the 1999 Dry Weather Screening Plan (MOA 1999) and updated in the Monitoring, Evaluation, and Quality Assurance Plan (QAP) prepared in 2011 and revised in 2012 and 2018 (MOA 2012, 2018). This monitoring plan has been updated in compliance with the terms of the 2020 permit and in consideration of 20 years of observational and quantitative data collected under the DWS program.

Each year, beginning in the summer of 2021, a minimum of 30 outfalls per year will be surveyed and monitoring of seven parameters will be conducted at outfalls where illicit discharges are suspected. Over the duration of the permit cycle, qualifying outfalls representing a variety of land uses in watersheds which contain qualifying outfalls will be sampled. Outfalls that have received reports of possible illicit discharges and outfalls with previous exceedances will have higher priority for monitoring.

The results of sampled flow analyses must be compared to MOA-established threshold levels and existing state water quality standards. Exceedances of the established thresholds trigger further action and provide information that will support that action. Follow-up investigation of recurring illicit discharges must be conducted within 15 days of its detection, and MOA must take necessary action to address the source of the ongoing illicit discharge within 45 days of its detection.

2.2. Outfall Selection Methodology and Rationale

Outfall selection will be performed in a semi-systematic way. Outfalls will be evaluated and scored at the beginning of the permit cycle, and outfalls to be screened will be selected at the beginning of each year. Outfalls that have a higher likelihood of illicit discharges will be receive higher priority for screening, but outfalls will be selected in a manner that ensures monitoring sites are geographically distributed.

2.2.1. Outfall Evaluation

Outfalls must be geographically dispersed across the MS4 and must represent all major land uses and areas in the MS4. In addition, the DWS program must include, but is not limited to, screening of outfalls that discharge to Category 4 and 5 waterbodies listed in the State of Alaska's most recent Integrated Report. Impaired waterbodies within the MOA are listed in the QAP. The List of Impaired Waters will be reviewed at the beginning of every year for any updates to listings of waterbodies within the MS4 area.

Prior to the first year of sampling under the current permit, outfalls from the MS4 will be evaluated for suitability for inclusion in the DWS program. Outfalls will be evaluated in a Geographic Information System (GIS) using the HGDB and field observations on outfall condition and location, previous years monitoring program. Outfalls suitable for inclusion in the DWS program will be preliminary identified, scored, and prioritized for monitoring. The HGDB is updated weekly and is available for download at https://data-muniorg.hub.arcgis. The HGDB will be reviewed at the beginning of every year for any updates to the MS4.

The DWS program will only evaluate outfalls that both: 1) fit the definition of an outfall provided at 40 Code of Federal Register [CFR] 122.26(b)(9),[2] and 2) are owned by the MOA or ADOT&PF. Outfalls from open conveyances, pipes or ditches that are privately owned, or pipes that convey streamflow will not be evaluated. Outfalls that discharge to low-impact design features (rain gardens, constructed swales, etc.) will also be excluded from monitoring.

Reasons for outfalls to be excluded from the DWS program include access constraints (private property, safety considerations), damage to the outfall that prevents monitoring or sampling, significant backwater flow into the outfall, the outfall is partially or fully submerged within a creek or waterbody, the outfall is connected to a pipe segment that also conveys streamflow, or inability to locate the outfall.

2.2.2. Outfall Scoring

Once outfalls suitable for inclusion in the DWS program have been identified, they will be scored and prioritized for monitoring. Outfalls will be given a numerical score based on factors that may contribute to the likelihood of illicit discharges within the outfall’s contributing area. The following point system will be used to score outfalls for monitoring over the permit cycle.

Contributing Area

MOA WMS has mapped the land areas that contribute runoff flows to stormwater conveyance networks in the HGDB. Points will be assigned to each outfall based on the size of the contributing area (in acres), determined from the outfall subbasin mapped in the HGDB:

Acres	Points
>500	15
250 – 400	12
100 – 250	9
50 – 100	6
10 – 50	3
1 – 10	1

Impervious Surface

Impervious surfaces such as pavement (roads, parking lots, industrial areas, etc.) and building rooftops prevent the infiltration of runoff water from precipitation events. Drainage areas with increased impervious surface area generate more stormwater runoff that is conveyed to waterbodies. Points will be assigned to each outfall based on the percentage of the contributing area to the outfall that is impervious surface, determined using the most recent available GIS data:

---

[2] “Outfall means a point source as identified by 40 CFR 122.2 at the point where a municipal separate storm sewer discharges to waters of the United States and does not include open conveyances connecting two municipal separate storm sewers, or pipes, tunnels, or other conveyances which connect segments of the same stream or other waters of the United States and are used to convey waters of the United States.”

% Impervious Area	Points
>90	5
70 – 89	4
50 – 69	3
<50	1

Land Use

Greater concentrations of most pollutants of concern are typically generated from industrial and commercial land uses than residential land uses. Points will be assigned to each outfall based on the percentage of the contributing area to the outfall that is zoned for commercial and industrial land uses, determined using the most recent zoning for the MOA:

% C/I Zoning	Points
>80	4
60 – 79	3
40 – 59	2
20 – 39	1
<20	0

Previous Exceedances

Outfalls that have previously exceeded the threshold for any indicator parameter monitored under the DWS program will be prioritized for subsequent monitoring. Previous data beginning in 2015 will be reviewed and points assigned will be weighted based on the years since the most recent exceedance was documented:

Years Since Exceedance	Points
1	5
2	4
3	3
4	2
5	1

Previous Reports of Illicit Discharge

MOA WMS maintains records of non-emergency water quality or pollutant problems reported by the public via the Pollution Hotline. Outfalls that are within subbasins where reports of potential illicit discharge have been investigated will be prioritized for subsequent monitoring under the current permit cycle. Previous data beginning in 2015 will be reviewed and points assigned will be weighted based on the years since the most recent report was made:

Years Since Report	Points
1	5
2	4
3	3
4	2
5	1

Impaired Waters

Outfalls that discharge to a listed Category 4 or 5 waterbody will be prioritized for monitoring. Points will be assigned based on the most current List of Impaired Waters:

Receiving Water is Listed Category 4 or 5	Points
Yes	3
No	0

Outfalls will be prioritized for monitoring based on the total number of points assigned. Outfall scoring and prioritization may be reevaluated during the permit cycle as updates to the data used to assign points are made. As new outfalls are added to the MS4 they will be scored and added to the prioritized list.

Additionally, many outfalls in Anchorage are suspected or known to convey groundwater that infiltrates into the MS4. These outfalls may be characterized by regular dry weather flows. Many of these outfalls have been investigated and screened under the DWS program and these regular dry weather flows have been found to not exceed any of the established indicator parameter thresholds or exhibit any other signs suggestive of illicit discharge. Data collected in previous years will be reviewed at the beginning of the permit cycle to identify outfalls that are suspected of conveying groundwater. These observations will establish a visual baseline for these outfalls to allow for distinguishing between background conditions and abnormal non-stormwater flows prohibited by the permit.

2.2.3. Outfall Selection

At least 30 outfalls targeted for screening will be selected at the beginning of each year during the permit cycle. Targeted outfalls will be distributed amongst three watersheds and multiple land use types each year when possible to ensure monitoring is geographically dispersed and distributed across all land uses. Outfalls may be selected out of the prioritized order to allow field crews to investigate outfalls within the same watershed or geographic region. Outfalls may also be selected based on recent reports of potential illicit discharges, or exceedances of indicator parameter thresholds. During subsequent years new outfalls will be selected from the prioritized list for monitoring, although some high-priority outfalls may be investigated more than once during the permit cycle.

2.3. Selection of Screening Thresholds and Rationale

The APDES permit specifies seven parameters that should be analyzed in samples of flow that is suspected of being illicit discharge. The *Illicit Discharge Detection and Elimination* guidance manual (CWP and Pitt 2004) suggests that ideal indicator parameters to identify illicit discharges should:

- Exhibit significantly different concentrations from clean stormwater
- Exhibit chemical characteristics of the potential discharge type
- Be easily measured with acceptable detection limits, accuracy, safety, and repeatability
- Be chemically and biologically conservative.

Table E-1 provides the screening parameters required by the permit and the MOA-established thresholds to which sampled flow analyses will be compared. Threshold levels are generally higher than the concentrations of the indicator parameters expected to be present in clean stormwater to reduce the instances of false positives. Values below the threshold are considered to be within an acceptable range for background concentrations. Values at or above the threshold concentration for a parameter indicate that the parameter may be above background concentrations. Outfalls that exceed the threshold (or are outside the pH range) for one or more of the indicator parameters will require follow-up action (see Section 4.7).

Table E-1. Indicator Parameters and Associated Thresholds

Parameter	Threshold
pH	≤ 4.0 or ≥ 9.0
Total Chlorine	≥ 1.0 mg/L
Detergents as Surfactants	≥ 1.0 mg/L
Total Copper	≥ 1.0 mg/L
Total Phenols	≥ 0.5 mg/L
Turbidity	≥ 250 NTU
Fecal Coliform	≥ 400 cfu/100 mL

Note: mg/L = milligrams per liter; NTU = nephelometric turbidity units; cfu = colony forming units

The indicator parameter thresholds in Table E-1 were established based on previously collected water quality data and field test kit detection limits, and are often higher than the current Alaska Water Quality Standards (AWQS) so as to be able to identify illicit discharges from background water chemistry. The thresholds were initially established in the 1999 Dry Weather Sampling Plan and have been reevaluated in subsequent QAP updates (MOA 1999, 2012, 2018). Thresholds were initially established based on the sensitivities of test kits previously used for analysis that are no longer commercially available. These thresholds are supported by the sensitivities and detection ranges of new test kits listed in Table 3 of the QAP. All parameter thresholds have been maintained from the previous DWS program protocol for the current permit cycle (MOA 2018). Each of the screening parameters is described in greater detail below.

2.3.1. pH

pH can serve as an indicator of commercial or industrial discharges, which may have a very low or high pH (below 3 or above 12; Pitt et al. 1993). The least stringent of Alaska's water quality standards for pH apply to waters designated for agricultural or industrial water supply, which may not be less than 5.0 or greater than 9.0 (ADEC 2020). The 2012 QAP established a threshold of less than 4.0 or greater than 9.0 as a conservative threshold to reduce the incidence of false positives. This threshold will be maintained.

2.3.2. Total Chlorine

Chlorine is a useful parameter for indicating large quantities of potable water discharge to the storm sewer system (Pitt et al. 1993). The Anchorage Water and Wastewater Utility (AWWU) reported the 2017 average chlorine residual in Anchorage tap water at 1.0 milligrams per liter (mg/L) and the maximum at 2.0 mg/L (AWWU 2018). The Environmental Protection Agency (EPA) maximum contaminant level for chlorine in drinking water is 4.0 mg/L. The 1.0 mg/L threshold is a conservative benchmark to test for indications of potable water discharge to the MS4 and will be maintained.

2.3.3. Detergents as Surfactants

The presence of detergents in stormwater indicates that sanitary wastewater or household or commercial wash water may be entering the MS4. Illicit discharge monitoring protocols most commonly monitor for the presence of detergents as surfactants. Typically, natural surface waters have surfactant concentrations below 0.1 mg/L, whereas surfactant concentrations in raw sanitary wastewaters commonly range from 1 to 20 mg/L (Pitt et al. 1993). The Hach® test kit measures detergents as surfactants detection range is 0.05 to 1.2 mg/L. The previously established threshold of 1.0 mg/L will be maintained based on these factors.

2.3.4. Total Copper

Copper can be an indicator of industrial process wastewater discharges to the storm sewer system. Copper can also be transported to the MS4 in runoff from commercial and industrial sites or from roadways. Total copper concentrations in Anchorage stormwater are generally measured in concentrations below 10 micrograms per liter (µg/L; HDR and Kinnetic Laboratories, Inc. 2018, HDR 2019, 2020). In 2015 AWWU monitoring found the 90th percentile of copper concentrations in Anchorage tap water to be 67 µg/L (AWWU 2018). The Hach® test kit measures total copper in the range of 0.1 to 4.0 mg/L. The previously established threshold of 1.0 mg/L will be maintained based on these factors.

2.3.5. Total Phenols

Phenols are a component of many commercial compounds that should not be found in stormwater. Discharges from riparian habitats and wetlands to the MS4, allowable under the MS4 permit provided that they do not contain pollutants, typically contain dissolved organic carbon that can potentially produce a false positive in the phenol test result. The Hach® test kit measures total phenols in the range of 0.1 to 5.0 mg/L. The previously established threshold of 0.5 mg/L was set to reduce the probability of false positive results and will be maintained.

2.3.6. Turbidity

Turbidity is a measurement of suspended matter in water. Elevated turbidity can indicate illicit discharges such as sewage, wash water, or industrial or commercial waste. The most stringent of Alaska’s water quality standards for turbidity in non-treated waters applies for contact recreation. Such waters are not to exceed 5 nephelometric turbidity units (NTU) above background conditions (when natural turbidity is 50 NTU or less; ADEC 2020). While this standard protects the beneficial uses of the receiving water, the screening threshold for the DWS program should provide assurance that false positives are not identified. The previously established threshold of 250 NTU provides stronger evidence of a potential illicit discharge than the water quality standard and will be maintained.

2.3.7. Fecal Coliform

Elevated fecal coliform bacteria concentrations can be an indicator of illicit wastewater discharges to the MS4. The most stringent of Alaska’s water quality standards for bacteria in non-treated waters applies for contact recreation. This standard requires that the geometric mean of samples taken in a 30-day period not exceed 126 colony forming units (cfu)/100 mL, and that no more than 10% of the samples exceed 410 cfu/100 mL (ADEC 2020). Because illicit discharges are typically transient in nature a geometric mean cannot be established. The previously established threshold of 400 cfu/100 mL in a single grab sample was set to provide a threshold sufficiently different from background conditions and will be maintained. This threshold will provide an indicator of illicit discharges of waste from humans, pets, and/or warm-blooded wildlife.

2.4. Schedule of Screening

DWS will be conducted from June 1st and August 30th of each year. Activities will be conducted following at least 48 hours of dry weather after any storm event that creates runoff to the MS4. As activities are weather dependent, the exact dates of sampling events may vary from year to year.

3.0 Monitoring Locations

Specific monitoring locations will be selected based on the outfall scoring methodology described in Section 2.2 and will be determined annually.

3.1. Monitoring of Suspected Illicit Discharges

At outfalls that are flowing during dry weather conditions, field crews will consider previous observations of dry weather flow from the outfall, if any, to determine whether the observed flow is consistent with baseline conditions that may originate from groundwater infiltration. Based on the visual observations and flow analysis the field crew will determine whether the dry weather flow from the outfall is suspected of being an illicit discharge. Field crews may also inspect up to three inlets to the MS4 in the targeted outfall's contributing area for evidence of illicit discharges or potential sources of pollutants in runoff (such as the prohibited discharges listed in Part 3.5.1.1 of the permit). Field crews will not perform any enforcement of permit terms nor provide notification to landowners of any suspected illicit discharges. Suspected illicit discharges will be reported to MOA WMS staff following inspection of the connected outfall, no later than 1 hour following observation.

4.0 Parameters and Methods

4.1. Methods, MDLs, Precision, Accuracy, and Completeness

Table E-2 lists the indicator parameters and the field or laboratory method that will be used for analysis of each. Test kits included in the Hach® Stormwater Multiparameter Water Quality Test Kit (Model SW-1) will be used for field monitoring the indicator parameters. If these kits are not commercially available throughout the course of the permit cycle, field test kits that employ equivalent methods will be used. Method detection limits, precision, and accuracy for these methods are provided in Tables 2, 3 and 4 of the QAP.

Table E-2. Sampling Methods for Indicator Parameters

Parameter	Method
Turbidity	Hach 2100P Turbidimeter, EPA method 180.1 Rev 2.0M
Fecal Coliform	SM 9222D
Hach Stormwater Test Kit, Model SW-1 #2481300	
pH	Hach Pocket Pro pH Tester, ion selective electrode, EPA method 150.1
Total Chlorine	Hach Method 8167[a], DPD/Color Disc, SM 4500-Cl G
Detergents	Hach Model DE-2, Toluidine Blue-O Chloroform/Color Disc
Total Copper	Hach Methods 8506 and 8026[a], Bicinchoninate/Color Disc, SM 3500-Cu C or E
Total Phenols	Hach Method 8047[a]: 4-Aminoantipyrine/Color Disc, EPA method 420.1

Note: SM = Standard Method

[a] Test kit uses equivalent or adapted method.

4.2. Site-Specific, Non-Direct Measurements

Prior to entering the field, the field crew will evaluate precipitation data to determine what er 48 hours has elapsed since the previous precipitation event that resulted in surface water runoff (approximately 0.1 inch).

Precipitation observations for the Anchorage area are available from the National Weather Service Anchorage Weather Forecast Office online at https://www.weather.gov/afc/alaskaObs. Data from the most appropriate weather station will be consulted depending on the watershed(s) to be investigated.

Two-person field teams will visit the targeted outfalls and visually inspect the outfall where it discharges into a receiving water. Screening activities to be conducted at each outfall will include recording visual observations about the condition of the outfall and the discharging water (if flowing), taking photographs of the outfall, and measuring or qualitatively describing the flow of the discharging water. Observations will be recorded on the field data form (Attachment E-1). Visual observations will include the following:

- Structural condition of the outfall
- Vegetation surrounding the outfall
- Biology (e.g., presence of fish or algae in stormwater)
- Outfall water conditions
    - Odors
    - Color
    - Clarity
    - Floatables
    - Deposits or stains
    - Sheen
    - Surface scum
    - Debris
- Other unusual conditions

Field crews will also document any damage to the outfall that may require MOA WMS or DOT&PF action.

5.0 Sampling Methods

5.1. Site-Specific Sample Methods, Handling, and Field QC

Two-person field teams will conduct field screening when weather permits (see Section 2.4). The field team(s) will conduct a safety briefing each day before departing for the field. Each team will bring the following equipment into the field:

- List of targeted outfalls
- GPS-enabled iPad loaded with HGDB and aerial imagery
- Field notebook
- Field forms with guidelines
- Water quality analysis protocols (included in the QAP)
- Personal protective equipment
- Field sampling supplies
- Hach Pocket Pro pH tester
- pH test strips
- Hach water quality field test kits
- Laboratory-supplied fecal coliform bottles
- Hach turbidimeter

Once the list of targeted outfalls has been established, field crews will review previous years' observations on the condition of the outfalls, any baseline flow expected during dry weather conditions, and access to the outfalls.

5.1.1. Flow Analyses

If an outfall is flowing, the field crew will measure flow by one of the following methods (from a position of safety):

Primary method
Measure the length of time required to fill a calibrated 1-liter bottle or 1-gallon bucket using a stopwatch. Calculate gallons per unit of time.

Secondary method
Visually estimate the flow as one of the following:

- Low – flow of water is not intense and moving very slowly;
- Medium – flow of water is moving at a moderate pace; or
- High – flow of water is intense and moving very quickly.

5.1.2. Water Quality Sampling

IF illicit discharge is suspected at an outfall, and after measuring the flow and recording visual observations, grab samples will be collected as described in Appendix F of this QAP. All samples will be collected from the water flowing directly out of the end-of-pipe. Samples collected from other areas are not representative. The field crew will collect a sample for laboratory analysis of fecal coliform and two grab samples to measure all other parameters using field test kits or water quality meters. The sample for laboratory analysis of fecal coliform will be collected in a laboratory-provided bottle. The two grab samples for field test kits will be collected using a clean 750-mL amber glass bottle (for the detergents test kit) and a clean 1-L HDPE plastic bottle (for all other field test kits and measurements). Results will be recorded on the data form in Attachment E-1. Field test kits will be recorded as soon as possible after sample collection, and field measurements will be recorded and compared against the thresholds in Table E-1.

When an indicator parameter exceeds the established threshold, field crews will immediately notify the MOA Project Manager of the location and parameter of exceedance so that follow-up actions can be initiated. The laboratory Project Manager will be requested to provide results of the fecal coliform analysis to the Contract QA Officer as soon as the results are available (typically within 24 hours). The Contract QA Officer will immediately notify the MOA Project Manager of any fecal coliform results that exceed the threshold. Follow-up actions are described in the flow chart in Attachment E-2.

Annually before sampling begins for the dry weather season, spiked samples will be provided by the contract laboratories to test the total copper and phenols field kits. The spiked sample will be used to ensure that the field test kits are reading accurately and that none of the reagents have been contaminated.

Equipment blank analyses will be conducted at the beginning of each day of screening prior to entering the field. Equipment blank analyses will examine each test kit by testing deionized water provided by the laboratory conducting fecal coliform analysis. Equipment blank procedures are described in the main body of this QAP. Equipment blank data will be recorded on the field data forms.

The field crew will conduct replicate sample analyses and collect replicate fecal coliform samples at a rate of 15 percent per day or once per day per parameter, whichever is greater. Replicate sampling procedures are described in the QAP.

5.2. Sample Preservation and Packing

Samples for fecal coliform analysis will be collected, preserved, and packed for transport to the laboratory as described in Appendix F of this QAP.

5.2.1. Chain of Custody

Instructions for the use and completion of the chain of custody forms are provided in Appendix F of this QAP.

5.3. Field Instrument Calibration

Instrument calibration will be conducted at the beginning of each day of screening prior to entering the field. Instrument calibration is addressed in Appendix G of this QAP. The calibration and test kit will be recorded in the day's field notes.

All instruments and field kits will be maintained according to the manufacturer's directions.

6.0 Training

Each field crew member will be trained in the following topics prior to conducting field work:

- Field safety
- Proper recording of data on field data forms
- Calibration and operation of all field equipment and test kits
- Sampling protocols
- Visual monitoring requirements
- Field quality control samples
- Sample preservation and packaging
- Chain of custody completion
- Transport of samples to the laboratory.

Before field crew members are allowed to do reportable work, they must demonstrate competence in conducting field analyses. An experienced field crew member will ensure that new field crew members are competent in all field procedures and test kit protocols.

7.0 Report

An annual report of the results of DWS program will be prepared. The report will include a brief introduction; a list of the outfalls monitored and maps showing their locations; visual observations recorded at each outfall including descriptions of any potential illicit discharges detected; field and laboratory results of any water quality sampling conducted; quality control/quality assurance; a discussion of the results; a description of any follow-up actions taken as a result of threshold exceedances; any deviations from the QAP; and recommended changes to the protocols for the upcoming year. The report will also identify any damaged outfalls or other maintenance issues observed during screening activities; areas where the HGDB may require updating; and any outfalls recommended for repeated monitoring under the current permit cycle.

8.0 References

ADEC (Alaska Department of Environmental Conservation). 2018. "Alaska's Impaired Waters and Watershed Planning." Accessed at https://dec.alaska.gov/water/water-quality/impaired-waters/ on January 5, 2021.

———. 2020. Water Quality Standards. 18 Alaska Administrative Code 70. Amended as of March 5, 2020.

AWWU (Anchorage Water & Wastewater Utility). 2018. Anchorage 2018 Drinking Water Quality Report. Accessed at https://www.awwu.biz/Home/ShowDocument?id=1558 on January 5, 2021.

CWP and Pitt, R. 2004. *Illicit Discharge Detection and Elimination, A Guidance Manual for Program Development and Technical Assessments*. Prepared by the Center for Watershed Protection and Robert Pitt, University of Alabama. October 2004

HDR Alaska, Inc. (HDR). 2019. 2019 Stormwater Outfall Monitoring Report. Prepared for Municipality of Anchorage Watershed Management Services. December 2019.

———. 2020. 2020 Stormwater Outfall Monitoring Report. Prepared for Municipality of Anchorage Watershed Management Services. December 2020.

HDR Alaska, Inc. and Kinnetic Laboratories, Inc. 2018. 2018 Stormwater Outfall Monitoring Report. Prepared for Municipality of Anchorage Watershed Management Services. December 2018.

MOA (Municipality of Anchorage). 1999. Illicit Discharge Program, Dry Weather Screening Plan. Document No. WMP CPp99001. Municipality of Anchorage, Watershed Management Program.

———. 2012. Monitoring, Evaluation, and Quality Assurance Plan. Document No. WMP APd10001. Prepared by HDR, Inc. and Municipality of Anchorage. October 2012.

———. 2018. Monitoring, Evaluation, and Quality Assurance Plan. Document No. WMP APd10016. Prepared by HDR, Inc. and Municipality of Anchorage. January 2018.

———. 2020. Hydrography Geodatabase. Watershed Management Services. Downloaded on December 16, 2020. Available at http://anchoragestormwater.com/datalibrary.html.

Pitt, R., M. Lalo, R. Field, D. Adrain, and D. Barbe. 1993. Investigation of Inappropriate Pollutant Entries into storm Drainage Systems. Publication No. EPA/600/R-92/239 January 1993.

Attachment E-1

Field Data Form

This page intentionally left blank.

Dry Weather Screening Field Data Form

Municipality of Anchorage APDES Monitoring Program

Watershed: _________________________ **Outfall Number:** _________________________

Part 1. General Information.

1. Date ______________________________ Time ________________
2. Field Crew ___________________________________ Water quality analyses conducted by ___________________________
3. Time since last rain event ☐ More than 48 hours ☐ Less than 48 hours
4. Size of last rain event ___________inches 5. Measured at weather station ____

Part 2. Visual Observations

6. End of pipe diameter _____________________ 7. Structural Condition: ____
8. Photographs (include camera name/#) ____
9. Suitable for sampling under DWS Program? ☐ No ☐ Yes ____
10. Water flowing from end of pipe? ☐ No ☐ Yes If yes, depth of water in end of pipe _____________________________

If No, take photographs of outfall and record any pertinent observations in comments. If Yes, continue.

11. Does the discharging water exhibit any of the following (if yes, describe in comments):

Odors? ☐ No ☐ Yes Color? ☐ Clear ☐ Cloudy/Muddy Clarity? ☐ Clear ☐ Colored __________________

Floatables? ☐ None ☐ Moving oily sheen ☐ Surface scum ☐ Soapy suds ☐ Debris ☐ Other (describe)

12. Vegetation ____________________________________ 13. Biology ____

Part 3. Field Analyses

14. Flow ____________gal/min OR ☐ Low ☐ Medium ☐ High
15. Previous observations of baseline dry weather flow? ____
16. Is an illicit discharge suspected at the outfall? ☐ No ☐ Yes

If No, proceed to next outfall. If Yes, continue. Describe any additional monitoring recommendations in comments.

17. Water Quality Analyses Duplicate sample collected? ☐ No ☐ Yes

Parameter	**Primary Sample**	**Duplicate Sample**	**Equipment Blank**	**Program Threshold**
pH	units	units	units	≤ 4.0 or ≥ 9.0
Total chlorine	mg/L	mg/L	mg/L	≥ 1.0 mg/L
Detergents	mg/L	mg/L	mg/L	≥ 1.0 mg/L
Total copper	mg/L	mg/L	mg/L	≥ 1.0 mg/L
Total phenols	mg/L	mg/L	mg/L	≥ 0.5 mg/L
Turbidity	NTU	NTU	NTU	≥ 250 NTU

Part 4. Comments

Guidelines for Completing the Dry Weather Screening Field Data Form

Use the following guidelines and the protocols detailed in Appendix E and Appendix F of the QAP to complete the field data form. ***A separate data form must be filled out for each outfall screened.***

Watershed: Watershed in which the outfall is discharging.
Outfall Number: Outfall identification number from the MOA HGDB.

Part 1. General Information
1. Date and time (in 24 hour clock) the outfall assessment begins.
2. Names of the field crew and staff conducting the water quality analyses.
3. Check the box that best represents when the last rainfall event occurred. "Rainfall event" is defined as a rainstorm big enough to cause runoff to the MS4 (approximately 0.1 inch or more).
4. The amount of rain that occurred and the duration of the storm.
5. The meteorological station where the antecedent precipitation data was recorded.

Part 2. Visual Observations
6. Diameter (in feet and/or inches) of the end of pipe. "End of pipe" (EOP) is the open end of a pipe discharging stormwater from the MS4 into the environment.
7. Observations on the structural condition of the outfall, connected network, streambank, or any other conditions. Flag any damaged outfalls or other maintenance issues observed for reporting to MOA WMS.
8. Descriptions of photograph(s) taken of the outfall. Record the name or identification number of the digital camera, iPad, or other device used to take the photographs and frame numbers, if applicable.
9. Based on the HGDB and field observations, does the outfall meet the criteria outlined in Appendix E for a suitable screening location under the Dry Weather Screening program?
10. Is water flowing from the EOP? Record the depth of water within the pipe in feet and/or inches. If you see standing water in the EOP or the EOP is partially or completely submerged in the receiving stream or waterbody, check "No". Check "Yes" only if water is flowing out of the EOP.
11. Qualitatively describe the discharging water. If any of these conditions are present, briefly describe in Comments.
Odors. NEVER place your head inside an of an outfall pipe or culvert. Note any odors detected in the general vicinity of the mouth of the outfall.
Color. Clear: Imagine a glass of drinking water, you can see through the water and the water is not colored. Colored: Imagine a glass of tea, you can see through the water, but the water is colored. Color can range from light to dark. Write a description of the color of the water on the line next to "Colored." If the water seems very lightly colored and you are in doubt, mark "Clear."
Clarity. Clear: Imagine a glass of drinking water or tea, you can see through the liquid regardless of color. Cloudy/Muddy: You cannot see through the water (it has a cloudy or muddy appearance).
Floatables. Moving oily sheen: Imagine pouring new or used motor oil onto water. Do you see this effect in the water flowing from the EOP? Only check this box if you see floating globs or a moving sheen of oil in the water flowing from the EOP. Surface scum: Scum can be a layer of organic material or impurities floating on the surface of the water. Soapy suds: Imagine what a bubble bath looks like. Debris: Debris includes any trash, garbage, vegetative material, etc. Other: Briefly describe in Comments.
12. Describe the presence and the condition of the vegetation around the outfall. Note if any vegetation is growing in the outfall.
13. Describe the biology that is observed in and around the site including wildlife, fish, algae, macroinvertebrates, etc.

Part 3. Field Analyses
14. Volume of water flowing out of the EOP per unit time.
Primary Method. Hold a calibrated 1- or a 5-gallon bucket under the flow from the end-of-pipe. Using a stopwatch, time how long it takes to fill with the bucket. If the bucket fills in less than one minute, record the number of seconds. Calculate the flow in gal/minute.
Secondary Method. If you are unable to use the primary method, use the secondary method and visually estimate the flow by checking one of the boxes that best describes the observed flow. Low: Flow not intense, water moving very slowly or trickling. Medium: Water moving at a moderate rate. High: Intense, water moving very quickly.
15. Consider previous observations of dry weather flow from the outfall, if any, to determine whether the observed flow is consistent with baseline conditions that may originate from groundwater infiltration as opposed to illicit discharge.
16. Determine, based on visual observations and flow analysis, whether the flow from the outfall is suspected illicit discharge. If No, proceed to the next outfall to be screened. If Yes, continue to water quality sampling.
17. Collect water samples and conduct the field test kits according to the protocols in Appendix E and Appendix F of the QAP.

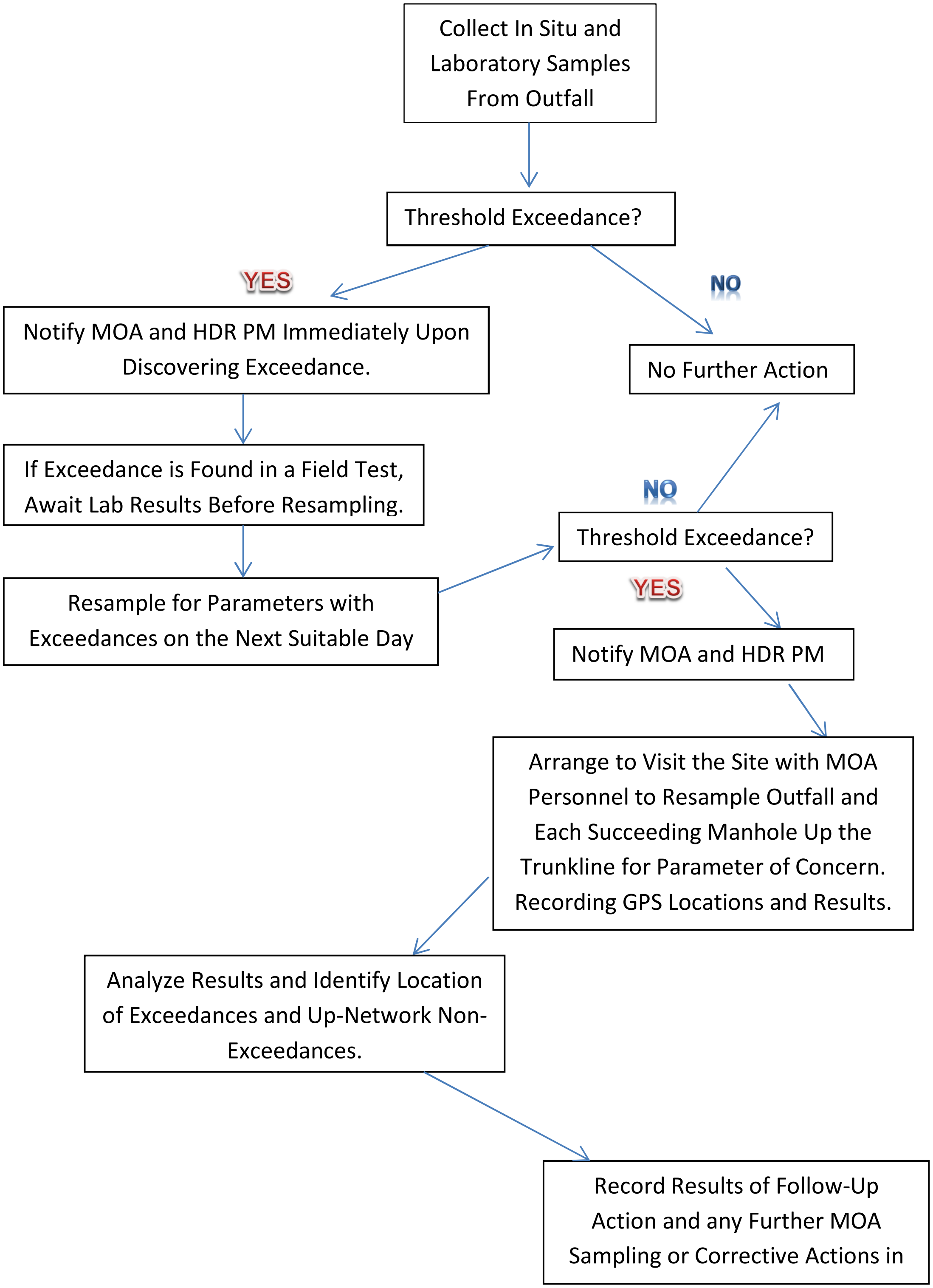
Part 4. Comments
As needed, explain answers. Record unusual observations of the outfall site not covered by the questions on the form.

Attachment E-2

Dry Weather Screening Follow Up Activities

This page intentionally left blank.

DRY WEATHER SCREENING FOLLOW-UP



Appendix F

Standard Operating Procedures

This page intentionally left blank.

Table of Contents

Attachments

1.0 Field Data Collection Standard Operating Procedures

The monitoring programs included in the Municipality of Anchorage's (MOA) Alaska Pollutant Discharge Elimination System (APDES) Monitoring Program include collection of water samples from waterbodies and from the Municipal Separate Storm Sewer System (MS4). The stormwater outfall monitoring and dry weather screening programs include collection of water samples from storm drain outfalls; the pesticide screening program involves collection of water samples from lakes; and the structural controls and snow storage site retrofit monitoring programs require collection of water samples from flowing water at designated stormwater control sites. The following sections describe the standard operating procedures (SOPs) that apply to the collection of water samples under all these monitoring programs. Individual monitoring plans for these programs are included as appendices to the Quality Assurance Plan (QAP).

1.1. Collecting Water Quality Samples

Upon arriving at a sample location, record visual observations in the field logbook. Next conduct the field analyses and replicates using probes and test kits, if applicable, and record measurements in the field logbook. Obtain grab samples and replicates as described below for the laboratory analyses.

1.1.1. Equipment Decontamination

Before handling the bottles, the sampler will decontaminate the sample container using the following procedure:

1. Put on nitrile gloves.
2. Using a non-metallic brush scrub the large inert composite sample container with a dilute Alconox® solution.
3. Rinse the container a minimum of three times with distilled de-ionized water.
4. Between each sample location, repeat the procedure.

1.1.2. Grab Sampling

Procedures for collecting grab samples are outlined below:

1. Label sample bottles as directed in Section B.3 of the QAP with the project name, date, time, preservative (if added), site identification, analysis, task lead's name, and the appropriate consulting firm.
2. Put on nitrile gloves.
3. Remove any trip blanks from the cooler for a minimum of 5 minutes during sampling activities. Do not open the zipper-seal bags in which the blank is enclosed and ensure that the blank gets returned to the cooler before leaving the site.

   Sample water for laboratory analysis and field parameters will be collected into a single inert, decontaminated sample collection container or directly into the laboratory sample bottle, when possible. Sample collection containers must be made of inert materials such as glass, Teflon, or stainless steel. Samples will be transferred from the sampling bottle to a laboratory analysis bottle. Fill all non-preserved sample bottles first, followed by preserved sample bottles to prevent cross-contamination from sample preservatives. Do not dunk the laboratory sample bottles into the sample collection container. For samples collected directly from the flow, place the laboratory sample bottle under the stream of flowing water, being careful not to over fill bottles that contain preservatives. For standing water behind a weir, submerge the sampling device approximately 2 to 3 inches below the water surface immediately behind the weir, being careful not to entrain sediments.
4. Sample bottles for total aromatic hydrocarbons (TAH) must not contain any air bubbles. This is

accomplished by pouring the sample from a clean collection bottle into the appropriate 40 mL vial until there is a slight convex meniscus at the top of the bottle, placing and tightening the cap, and inverting the bottle to ensure no air bubbles are trapped. TAH bottles contain preservative, thus they cannot be poured out and re-filled.

5. Fill out the appropriate field forms documenting sampling location, time, and other pertinent information before leaving the sampling station.

1.1.3. Sample Packing

Samples collected in the field for laboratory analysis will be labeled and packed for transport as follows:

1. Ensure sample bottle is labeled as described in the QAP.
2. Place each sample bottle in a zip-locked bag.
3. Pack sample bottles into insulated ice chests with either gel ice (freezable gel packs) or crushed ice that is double-bagged in zip-locked plastic bag.
4. Maintain temperatures in the cooler as listed in Table 7 of the QAP (plus or minus 2 °C) until delivered to the laboratory. Temperature in transit will be monitored with a temperature blank provided by the laboratory.
5. Complete a chain of custody form for each packed ice chest. Place the form in a plastic zip-locked bag in the ice chest. All samples will be in control of the field crew until they are delivered to the laboratory, at which time the chain of custody form will be signed by the laboratory personnel indicating that they have assumed custodial responsibility. An example chain of custody form is included in this appendix as Attachment F-1.
6. In the event that full sample coolers are removed from the direct control of the sampling team without being transferred to the laboratory, custody seals will be placed on the cooler from lid to base and taped in place with clear packing tape.

1.2. Measurement of Field Parameters

A YSI 556 multi-probe meter or equivalent will be used to measure the following field parameters: specific conductance, temperature, pH, and dissolved oxygen (DO). A Hach® 2100P meter will be used to measure turbidity. The procedures for using these instruments are described below.

Field crews will bring turbidity, pH, and conductivity calibration solutions along with the meter to the field each day in case a reading or meter function warrants either a calibration check or recalibration. Calibration data will be recorded in the field logbook for the specific monitoring project. Maintenance and calibration of field equipment is described in Appendix G of the QAP.

1.2.1. YSI 556 Meter

1. Turn the YSI 556 on.
2. Place the probe in flowing storm water or waterbody to be sampled and allow it to equilibrate. If the flow is insufficient to submerge the probe, use a clean sample collection container to collect the flowing water and submerge the probe in water once it is overflowing the container. Allow the meter to equilibrate. The meter should equilibrate within five minutes.
3. Record the YSI meter number.
4. Once the readings have stabilized or 5 minutes have passed (whichever comes first), record all parameters at the same time.

1.2.2. Hach® 2110P Meter

1. Turn on the instrument, and place it on a flat, sturdy surface.

2. Check the calibration of the turbidimeter (following steps 3, 5 and 6 below) and record the results for each:
    a. Run a cycle with an empty chamber (no vial).
    b. Run a clean vial (see step 3) filled with deionized (DI) water. The empty meter reading should be < 0.1 nephelometric turbidity unit (NTU).
    c. Run each secondary standard using the appropriate pre-assigned reading for the meter in use. The meter should read within ± 5% of the assigned value for the standards.
    d. In the event the meter is out of calibration, a back-up meter will be used.
3. Clean the sample cell using a KimWipe® tissue and several rinses with DI water. Be careful to handle the cell by the top to avoid smudging or scratching the glass. Do not use paper towels on cells.
4. Invert (do not shake) the sample collection bottle (See Section 1.1.2) once to re-suspend any material and fill the cell with sample water. Apply a thin film of silicone oil to the outside of the cell. Wipe with a KimWipe® tissue to create an even film on the surface of the cell. Avoid excess oil.
5. Place the sample cell in the instrument compartment making sure that the orientation mark on the cell aligns with the raised mark on the meter. Close the lid.
6. Press **Read**. The final measurement will display after approximately 13 seconds. If the reading is very unstable; press **Signal Average** to average 10 measurements. This action takes approximately 20 seconds.
7. Record the meter number and the meter reading on the field data form.
8. Use the same sample cell for all samples collected during the sampling event. Rinse the sample cell with DI water between each sample.

1.3. Measurement Using Field Test Kits

Various reagents are potential health hazards. Obey safety procedures and wear all of the personal protective equipment appropriate to the chemicals that are handled. Refer to the current safety data sheets (SDS) for hazard and handling information. SDS for all reagents are included as Attachment F-2.

The following instructions are reproduced from the user manual for the Hach® Stormwater Multiparameter Water Quality Test Kit (Model SW-1). Refer to the user manual for complete instructions.

1.3.1. Demineralized Bottle Procedure

To use the included demineralizer bottle, fill the bottle with tap water and shake to mix. Use the water from the demineralizer bottle as deionized water in the test procedure. Fill the bottle again when empty. Replace the resin after the bottle is filled approximately 100 times.

1.3.2. Hach Total Chlorine Test Kit Instructions

1. Fill two tubes to the first line (5 mL) with sample.
2. Put one tube into the left opening of the color comparator box.
3. Add one DPD Total Chlorine Powder Pillow to the second tube.
4. Wait 3 minutes. Read the result within 6 minutes.
5. Put the second tube into the color comparator box.
6. Hold the color comparator box in front of a light source. Turn the color disc to find the color match.
7. Read the result in mg/L in the scale window.

1.3.3. Hach Phenols in Water Test Kit Instructions

If the sample contains turbidity, complete the filtration procedure for turbid samples, outlined below.

1. Fill two tubes to the top line with sample.
2. Add one EDTA Reagent Powder Pillow to each tube.
3. Put a cap on each tube. Swirl to mix until the reagent is dissolved.
4. Add 15 drops of Hardness 1 Buffer Solution to each tube.
5. Put a cap on each tube. Swirl to mix.
6. Put one tube into the left opening of the color comparator box.
7. Add one Phenol Reagent Powder Pillow for non-extraction method to the second tube.
8. Put a cap on the tube. Swirl to mix until the reagent is dissolved.
9. Add one Potassium Persulfate Powder Pillow for phosphonate to the second tube.
10. Put a cap on the tube. Swirl to mix until the reagent is dissolved.
11. Put the second tube into the color comparator box.
12. Hold the color comparator box in front of a light source. Turn the color disc to find the color match.
13. Read the result in mg/L in the scale window.

If the water sample contains turbidity, filter the sample using the procedure provided below.

1. Put a 0.45-µm filter disc in the 25-mm filter holder. Tighten the filter holder.
2. Fill a 30-cc syringe with sample. Attach the syringe to the filter holder.
3. Put the filter holder on the tube.
4. Push the sample through the filter.
5. Use the filtered sample in the test procedure.

1.3.4. Hach Detergents Test Kit Instructions

WARNING: The chemicals in this kit may be hazardous to the health and safety of the user if inappropriately handled. Read all warnings carefully before performing the test and use appropriate safety equipment.

1. Fill a glass tube to the top line (20 mL) with deionized water.
2. Put the tube into the left opening of the color comparator box.
3. Fill a second glass tube to the top line (20 mL) with sample.
4. Add 12 drops of Detergents Reagents.
5. Put the stopper on the second tube. Shake to mix.
6. Add Chloroform to the first line (5 mL). Chloroform is heavier than water and goes to the bottom of the tube.
7. Put the stopper on the tube. Shake vigorously for 30 seconds.
8. Do not touch the tube for 1 minute to let the chloroform separate from the sample.
9. Use the transfer pipet to remove the top water layer from the tube. Discard the water.
10. Add Wash Water Buffer Solution to the top mark (20 mL).
11. Use the transfer pipet to remove the Wash Water Buffer. Discard the buffer. This step removes the remaining water sample.
12. Add Wash Water Buffer to the top mark (20 mL).

13. Put the stopper on the tube. Shake vigorously for 30 seconds.
14. Do not touch the tube for 1 minute to let the chloroform separate.
15. If the sample contains turbidity, complete the filtration procedure for turbid samples, outlined below.
16. Put the second tube into the color comparator box.
17. Hold the color comparator box in front of a light source. Turn the color disc to find the color match.
18. Read the result in the mg/L in the scale window.

Always empty and rinse tubes promptly after testing to avoid staining.

If the water sample contains turbidity, pour the chloroform layer through a filter during the test procedure after step 15, using the procedure provided below.

1. Put a small ball (the size of a large pea) of glass wool in the filter thimble.
2. Using the transfer pipet to remove the chloroform layer from the viewing tube.
3. Put the filter thimble on a clean test tube. Add the chloroform to the filter thimble.
4. Use the filtered chloroform to continue the test procedure after step 15.

1.3.5. Hach Free and Total Copper Test Kit Instructions

1. Fill two test tubes to the first line (5mL) with sample.
2. Put one tube into the left opening of the color comparator box.
3. Add one Free Copper Reagent Powder Pillow to the second tube.
4. Put a stopper on the tube. Invert to mix.
5. Wait 2 minutes. A purple color develops if free copper is in the sample.
6. Put the second tube into the color comparator box.
7. Hold the color comparator box in front of a light source. Turn the color disc to find the color match.
8. Read the mg/L free copper in the scale window. Record the value.
9. To determine total dissolved copper, add one Hydrosulfite Reagent Powder Pillow to the second tube.
10. Put a stopper on the tube. Invert to mix.
11. Wait two minutes.
12. Put the second tube into the color comparator box.
13. Hold the color comparator box in front of a light source. Turn the color disc to find the color match.
14. Read the mg/L total dissolved copper in the scale window.

Always empty and rinse tubes promptly after testing to avoid staining.

2.0 Flow Monitoring Standard Operating Procedures

2.1. Weir Evaluation

When assessing weirs for usability or installing temporary weirs, the weir must meet the following criteria:

1. Weir crest should be a sharp edge so that the nappe of the weir springs free from the crest at overfall.
2. The nappe should not be partially submerged in the tail water below the weir.
3. The pool behind the weir should be calm without significant velocity as it approaches the weir.

4. The minimum head should be 0.2 feet to prevent the nappe from clinging to the crest of the weir.
5. The head measurement should be made a minimum of four times the height of the water over the weir upstream from the crest of the weir.

2.2. Staff Gage Measurements

When obtaining staff gage measurements in the field, the observer should ensure that:

1. The staff gage is placed adjacent to the weir, where it will not interfere with flow over the weir.
2. Sediments have not accumulated behind the weir.
3. The observer’s eye must be level to the water level when reading the staff gage.
4. Record the staff gage measurement to the nearest 0.01 inch.

2.3. Data Logger QC Measurements

To ensure data loggers are accurately calibrated, use the following procedures prior to a storm event and during a storm event:

1. Observe the staff gage as described in Section 2.2.
2. Record the exact time of manual measurement.
3. Compare that measurement with the data logger measurement from the same time. If a difference exists:
    a. Adjust the data logger to eliminate the difference, if the quality control is conducted prior to a storm event.
    b. Adjust the flow data by a correction factor, if the difference is detected during a storm event.

This page intentionally left blank.

Attachment F-1

Chain of Custody Form

This page intentionally left blank.

CHAIN OF CUSTODY

Laboratory Name		Date:	Page: of
Laboratory Address	Phone:	Project Manager:	
Anchorage, AK	FAX:	Project Name:	
		Location:	City:
Client:		Collector:	Date of Collection:
Address:			
Phone:			
Client Project #:			

Sample Number	Time	Sample Type	Container Type	Chloride (300.0)	Total Copper (200.8)	BOD5 (SM 5210B)	Fecal coliform (SM 9222D)	TSS SM (2540D)	TAH (624)	TAqH(625)	2,4-D (8151A)	Carbaryl (8270C)	Other	Field Notes
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														

Relinquished by:	Date/Time	Received by:	Date/Time
Relinquished by:	Date/Time	Received by:	Date/Time
Relinquished by:	Date/Time	Received by:	Date/Time

Sample Receipt:		
Good Condition?		
Cold?		
Seals intact?		
Total # Containers		

Remarks:

Distribution: White - Lab; Yellow - File; Pink - Originator

Sample Label Example
XXX Laboratory

Field Information:
Sample Number: ______________________
Sample Location: ______________________
Sample: ______________ of ____________
Date:______________ Time:______________
Preservation Method: ___________________
Printed Name & Sgnature of Sample Collector:
____
____

Phone: _______________________
Comments: ____________________________

Attachment F-2
Safety Data Sheets

Safety Data Sheet
according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and GHS

Effective date: 11/20/2014 **Revision:** 05/12/2015

ALCONOX

1 Identification of the Substance/mixture and of the Company/Undertaking

1.1 Product identifier

Trade name: **ALCONOX**

Application of the substance / the preparation: Cleaning material/ Detergent

1.2 Relevant identified uses of the substance or mixture and uses advised against:

No additional information available.

1.3 Details of the supplier of the Safety Data Sheet

Manufacturer/Supplier:

Alconox, Inc.
30 Glenn St., Suite 309
White Plains, NY 10603
Phone: 914-948-4040

Further information obtainable from: Product Safety Department

1.4 Emergency telephone number:

ChemTel Inc.: (800)255-3924, +1 (813)248-0585

2 Hazards Identification

2.1 Classification of the substance or mixture Classification according to Regulation (EC) No 1272/2008:

Eye Irrit. 2B; H320: Causes eye irritation.

Information concerning particular hazards for human and environment:

The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.

Classification system:

The classification is according to the latest editions of the EU-lists, and extended by company and literature data

2.2 Label elements

Labelling according to Regulation (EC) No 1272/2008:

The product is classified and labelled according to the CLP regulation.

Hazard pictograms:

Signal word: Warning

Hazard-determining components of labelling:

Sodium Alkylbenzene Sulfonate

Hazard statements:

H320: Causes eye irritation.

Precautionary statements:

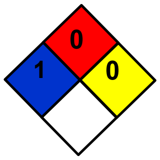
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P264: Wash thoroughly after handling.
P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337+P313: If eye irritation persists: Get medical advice/attention.

Other Hazard description:

WHMIS-classification and symbols:

D2B - Toxic material causing other toxic effects

NFPA ratings (scale 0 - 4)



Health = 1
Fire = 0
Reactivity = 0

HMIS-ratings (scale 0 - 4)

HEALTH	1	🟦
FIRE	0	🟥
REACTIVITY	0	🟨

Health = 1
Fire = 0
Reactivity = 0

2.3 Other hazards

Results of PBT and vPvB assessment

PBT: Not applicable.

vPvB: Not applicable.

3 Composition/Information on Ingredients

3.2 Chemical characterization: Mixture

Description: Hazardous ingredients of mixture listed below.

Identifying Nos.	Description	Wt. %
CAS: 68081-81-2	Sodium Alkylbenzene Sulfonate	10 - 25%
CAS: 497-19-8	Sodium Carbonate	5-15%
CAS: 7722-88-5	Tetrasodium pyrophosphate	5-15%
CAS: N/A	Proprietary (non-classified)	40-60%

Additional information: For the wording of the listed risk phrases refer to section 16.

4 First Aid Measures

4.1 Description of first aid measures

General information:

Contaminated individuals of chemical exposure must be taken for medical attention if any adverse effect occurs. Rescuers should be taken for medical attention, if necessary. Take copy of label and SDS to health professional with contaminated individual.

After inhalation:

Supply fresh air; consult doctor in case of complaints.

After skin contact:

Immediately wash with water and soap and rinse thoroughly. If skin irritation continues, consult a doctor.

After eye contact:

Remove contact lenses if worn. Rinse opened eye for several minutes under running water. If symptoms persist, consult a doctor.

After swallowing:

Rinse out mouth and then drink plenty of water. Do not induce vomiting; call for medical help immediately.

4.2 Most important symptoms and effects, both acute and delayed:

No additional information available.

4.3 Indication of any immediate medical attention and special treatment needed:

No additional information available.

5 Firefighting Measures

5.1 Extinguishing media:

Suitable extinguishing agents:

CO2, powder or water spray. Fight larger fires with water spray or alcohol resistant foam.

5.2 Special hazards arising from the substance or mixture:

No additional information available.

5.3 Advice for firefighters:

Protective equipment:

Wear self-contained respiratory protective device.
Wear fully protective suit.

6 Accidental Release Measures

6.1 Personal precautions, protective equipment and emergency procedures:

Product forms slippery surface when combined with water.

6.2 Environmental precautions:

Do not allow product to reach sewage system or any water course.

6.3 Methods and material for containment and cleaning up:

Pick up mechanically.
Clean the affected area carefully; suitable cleaners are: Warm water

6.4 Reference to other sections:

See Section 7 for information on safe handling.
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information

7 Handling and Storage

7.1 Precautions for safe handling:

Ensure good ventilation/exhaustion at the workplace.
Keep receptacles tightly sealed.
Prevent formation of dust.

Information about fire - and explosion protection: No special measures required.

7.2 Conditions for safe storage, including any incompatibilities:

Storage:

Requirements to be met by storerooms and receptacles: No special requirements.
Information about storage in one common storage facility: None required.
Further information about storage conditions: Protect from humidity and water.

7.3 Specific end use(s): No additional information available.

8 Exposure Controls/Personal Protection

8.1 Control parameters

Ingredients with limit values that require monitoring at the workplace: Not required.

Additional information: The lists valid during the making were used as basis.

8.2 Exposure controls:

Personal protective equipment:

General protective and hygienic measures:

Keep away from foodstuffs, beverages and feed.
Immediately remove all soiled and contaminated clothing.
Wash hands before breaks and at the end of work.
Avoid contact with the skin.
Avoid contact with the eyes and skin.

Respiratory protection:

Not required under normal conditions of use.
In case of brief exposure or low pollution use respiratory filter device.
In case of intensive or longer exposure use self-contained respiratory protective device.

Protection of hands:

Protective gloves

The glove material has to be impermeable and resistant to the product. Selection of the glove material should be based on the penetration time, rates of diffusion and the degradation of the glove material.

Material of gloves:

The selection of a suitable gloves does not only depend on the material, but also on the quality, and varies from manufacturer to manufacturer.

Penetration time of glove material:

The exact break through time has to be determined by the manufacturer of the protective gloves. DO NOT exceed the breakthrough time set by the Manufacturer.

For long term contact, gloves made of the following materials are considered suitable:

Butyl rubber, BR
Nitrile rubber, NBR
Natural rubber (NR)
Neoprene gloves

Eye protection:

Safety glasses

Body protection: Protective work clothing

9 Physical and Chemical Properties

9.1 Information on basic physical and chemical properties:

General Information:	
Appearance:	
Form:	Powder
Color:	White
Odor:	Odorless
Odor threshold:	Not determined.
pH-value (10 g/l) at 20°C:	9.5 (NA for Powder form)
Change in condition:	
Melting point/Melting range:	Not determined.
Boiling point/Boiling range:	Not determined.

Flash point:	Not applicable.
Flammability (solid, gaseous):	Not determined.
Ignition temperature:	Not determined.
Decomposition temperature:	Not determined.
Self-igniting:	Product is not selfigniting.
Danger of explosion:	Product does not present an explosion hazard.
Explosion limits:	
Lower:	Not determined.
Upper:	Not determined.
Vapor pressure:	Not applicable.
Density at 20°C:	1,1 g/cm³
Relative density:	Not determined.
Vapor density:	Not applicable.
Evaporation rate:	Not applicable.
Solubility in / Miscibility with water:	Soluble.
Segregation coefficient (n-octanol/water):	Not determined.
Viscosity:	
Dynamic:	Not applicable.
Kinematic:	Not applicable.
Solvent content:	
Organic solvents:	0.0 %
Solids content:	100 %
9.2 Other information:	No additional information available.

10 Stability and Reactivity

10.1 Reactivity:

10.2 Chemical stability:

Thermal decomposition / conditions to be avoided:

No decomposition if used according to specifications.

10.3 Possibility of hazardous reactions:

Reacts with acids.
Reacts with strong alkali.
Reacts with strong oxidizing agents.

10.4 Conditions to avoid:

No additional information available.

10.5 Incompatible materials:

No additional information available.

10.6 Hazardous decomposition products:

Carbon monoxide and carbon dioxide
Phosphorus compounds
Sulphur oxides (SOx)

11 Toxicological Information

11.1 Information on toxicological effects:

Toxicity data: No additional information available.

Primary irritant effect:

On the skin: Irritating to skin and mucous membranes.

On the eye: Strong irritant with the danger of severe eye injury.

Sensitization: No sensitizing effects known.

Additional toxicological information:

The product shows the following dangers according to the calculation method of the General EU Classification Guidelines for Preparations as issued in the latest version: Irritant.
Swallowing will lead to a strong caustic effect on mouth and throat and to the danger of perforation ofesophagus and stomach.

12 Ecological Information

12.1 Toxicity:
Aquatic toxicity: No additional information available.
12.2 Persistence and degradability: No additional information available.
12.3 Bioaccumulative potential: Not worth-mentioning accumulating in organisms.
12.4 Mobility in soil: No additional information available.
Ecotoxical effects:
Remark: Harmful to fish
Additional ecological information:
General notes:
Water hazard class 2 (German Regulation) (Self-assessment): hazardous for water.
Do not allow product to reach ground water, water course or sewage system.
Danger to drinking water if even small quantities leak into the ground.
12.5 Results of PBT and vPvB assessment:
PBT: Not applicable.
vPvB: Not applicable.
12.6 Other adverse effects: No additional information available.

13 Disposal Considerations

13.1 Waste treatment methods:
Recommendation:
Smaller quantities can be disposed of with household waste.
Small amounts may be diluted with plenty of water and washed away. Dispose of bigger amounts in accordance with Local Authority requirements.
The surfactant used in this product complies with the biodegradability criteria as laid down in Regulation (EC) No. 648/2004 on detergents. Data to support this assertion are held at the disposal of the competent authorities of the Member States and will be made available to them, at their direct request or at the request of a detergent manufacturer.
Uncleaned packaging:
Recommendation: Disposal must be made according to official regulations.
Recommended cleansing agents: Water, together with cleansing agents, if necessary.

14 Transport Information

14.1 UN-Number:	
DOT, ADR, ADN, IMDG, IATA:	Not Regulated
14.2 UN proper shipping name:	
DOT, ADR, IMDG, IATA:	Not Regulated
14.3 Transport hazard class(es):	
DOT, ADR, IMDG, IATA:	
Class:	Not Regulated
Label:	-
14.4 Packing group:	
DOT, ADR, IMDG, IATA:	Not Regulated

14.5 Environmental hazards:	
Marine pollutant:	No
14.6 Special precautions for user:	Not applicable.
14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code:	Not applicable.
UN "Model Regulation":	Not Regulated

15 Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture:

United States (USA):

SARA:

Section 355 (extremely hazardous substances): None of the ingredient is listed.

Section 313 (Specific toxic chemical listings): None of the ingredient is listed.

TSCA(Toxic Substances Control Act): All ingredients are listed.

Proposition 65 (California):

Chemicals known to cause cancer: None of the ingredient is listed.

Chemicals known to cause reproductive toxicity for females: None of the ingredient is listed.

Chemicals known to cause reproductive toxicity for males: None of the ingredient is listed.

Chemicals known to cause developmental toxicity: None of the ingredient is listed.

CarcinogenicCategories:

EPA (Environmental Protection Agency): None of the ingredient is listed.

TLV (Threshold Limit Value established by ACGIH): None of the ingredient is listed.

NIOSH-Ca (National Institute for Occupational Safety and Health): None of the ingredient is listed.

OSHA-Ca (Occupational Safety & Health Administration): None of the ingredient is listed.

Canadá:

Canadian Domestic Substances List (DSL): All ingredients are listed.

Canadian Ingredient Disclosure list (limit 0.1%): None of the ingredient is listed.

Canadian Ingredient Disclosure list (limit 1%):

497-19-8	Sodium Carbonate
7722-88-5	Tetrasodium pyrophosphate
151-21-3	Sodium dodecyl sulphate

15.2 Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

16 Other Information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

Relevant phrases:

H320: Causes eye irritation.

Abbreviations and Acronyms:

ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road.
IMDG: International Maritime Code for Dangerous Goods.
DOT: US Department of Transportation.
IATA: International Air Transport Association.
GHS: Globally Harmonized System of Classification and Labelling of Chemicals.
ACGIH: American Conference of Governmental Industrial Hygienists.
NFPA: National Fire Protection Association (USA).
HMIS: Hazardous Materials Identification System (USA).
WHMIS: Workplace Hazardous Materials Information System (Canada).
VOC: Volatile Organic Compounds (USA, EU).
LC50: Lethal concentration, 50 percent.
LD50: Lethal dose, 50 percent.

SDS Created by:

Global Safety Management, Inc.
10006 Cross Creek Blvd
Tampa, FL, 33647
Tel: 1-844-GSM-INFO (1-844-476-4636)
Website: www.GSMSDS.com

Hydrochloric Acid, 37% w/w

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 08/16/1998   Revision date: 05/05/2014   Supersedes: 07/03/2013   Version: 1.1

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product form : Substance
Substance name : Hydrochloric Acid, 37% w/w
CAS No : 7647-01-0
Product code : LC14950
Formula : HCl
Synonyms : Hydrochloric acid / hydrochloric acid, conc=37%, aqueous solution
BIG no : 29443

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture : Laboratory chemical

1.3. Details of the supplier of the safety data sheet

LabChem Inc
Jackson's Pointe Commerce Park Building 1000, 1010 Jackson's Pointe Court
Zelienople, PA 16063 - USA
T 412-826-5230 - F 724-473-0647
info@labchem.com - www.labchem.com

1.4. Emergency telephone number

Emergency number : CHEMTREC: 1-800-424-9300 or 011-703-527-3887

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

GHS-US classification

Acute Tox. 4 (Oral)	H302
Skin Corr. 1B	H314
Eye Dam. 1	H318
STOT SE 3	H335
Aquatic Acute 3	H402

2.2. Label elements

GHS-US labelling

Hazard pictograms (GHS-US) :


GHS05


GHS07

Signal word (GHS-US) : Danger

Hazard statements (GHS-US) : H302 - Harmful if swallowed
H314 - Causes severe skin burns and eye damage
H335 - May cause respiratory irritation
H402 - Harmful to aquatic life

Precautionary statements (GHS-US) : P260 - Do not breathe mist, spray, vapours
P264 - Wash exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P271 - Use only outdoors or in a well-ventilated area
P273 - Avoid release to the environment
P280 - Wear eye protection, face protection, protective clothing, protective gloves
P301+P330+P331 - IF SWALLOWED: rinse mouth. Do NOT induce vomiting
P303+P361+P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower
P304+P340 - IF INHALED: remove victim to fresh air and keep at rest in a position comfortable for breathing
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
P363 - Wash contaminated clothing before reuse

P403+P233 - Store in a well-ventilated place. Keep container tightly closed
P405 - Store locked up
P501 - Dispose of contents/container to Comply with applicable regulations

2.3. Other hazards

Other hazards not contributing to the classification	: None under normal conditions.

2.4. Unknown acute toxicity (GHS-US)

No data available

SECTION 3: Composition/information on ingredients

3.1. Substance

Substance type	: Multi-constituent
Name	: Hydrochloric Acid, 37% w/w
CAS No	: 7647-01-0

Name	Product identifier	%	GHS-US classification
Water	(CAS No) 7732-18-5	63	Not classified
Hydrogen Chloride	(CAS No) 7647-01-0	37	Compressed gas, H280 Acute Tox. 3 (Inhalation), H331 Skin Corr. 1A, H314

Full text of H-phrases: see section 16

3.2. Mixture

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general	: Check the vital functions. Unconscious: maintain adequate airway and respiration. Respiratory arrest: artificial respiration or oxygen. Cardiac arrest: perform resuscitation. Victim conscious with laboured breathing: half-seated. Victim in shock: on his back with legs slightly raised. Vomiting: prevent asphyxia/aspiration pneumonia. Prevent cooling by covering the victim (no warming up). Keep watching the victim. Give psychological aid. Keep the victim calm, avoid physical strain. Depending on the victim's condition: doctor/hospital.
First-aid measures after inhalation	: Remove the victim into fresh air. Respiratory problems: consult a doctor/medical service.
First-aid measures after skin contact	: Wash immediately with PE-glycol 400. Wash immediately with lots of water (15 minutes)/shower. Remove clothing while washing. Do not remove clothing if it sticks to the skin. Cover wounds with sterile bandage. Consult a doctor/medical service. If burned surface > 10%: take victim to hospital.
First-aid measures after eye contact	: Rinse immediately with plenty of water for 15 minutes. Do not apply neutralizing agents. Take victim to an ophthalmologist.
First-aid measures after ingestion	: Rinse mouth with water. Immediately after ingestion: give lots of water to drink. Do not induce vomiting. Immediately consult a doctor/medical service. Call Poison Information Centre (www.big.be/antigif.htm). Take the container/vomit to the doctor/hospital. Do not give chemical antidote. Ingestion of large quantities: immediately to hospital.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries after inhalation	: Dry/sore throat. Coughing. Irritation of the respiratory tract. Irritation of the nasal mucous membranes. EXPOSURE TO HIGH CONCENTRATIONS: Respiratory difficulties. Possible laryngeal spasm/oedema. Corrosion of the upper respiratory tract. FOLLOWING SYMPTOMS MAY APPEAR LATER: Risk of pneumonia. Risk of lung oedema.
Symptoms/injuries after skin contact	: Caustic burns/corrosion of the skin.
Symptoms/injuries after eye contact	: Corrosion of the eye tissue. Permanent eye damage.
Symptoms/injuries after ingestion	: Burns to the gastric/intestinal mucosa. Blood in vomit. Possible esophageal perforation. Shock.

4.3. Indication of any immediate medical attention and special treatment needed

Obtain medical assistance.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media	: EXTINGUISHING MEDIA FOR SURROUNDING FIRES: All extinguishing media allowed.
Unsuitable extinguishing media	: No unsuitable extinguishing media known.

5.2. Special hazards arising from the substance or mixture

Fire hazard : DIRECT FIRE HAZARD. Non combustible. INDIRECT FIRE HAZARD. Reactions involving a fire hazard: see "Reactivity Hazard".

Explosion hazard : INDIRECT EXPLOSION HAZARD. Reactions with explosion hazards: see "Reactivity Hazard".

Reactivity : Decomposes on exposure to temperature rise: release of (highly) toxic gases/vapours (chlorine). On exposure to air: release of corrosive mist. Reacts violently with (some) bases. Reacts exothermically with many compounds. Reacts with (strong) oxidizers: release of (highly) toxic gases/vapours (chlorine). Reacts with (some) metals: release of highly flammable gases/vapours (hydrogen).

5.3. Advice for firefighters

Precautionary measures fire : Exposure to fire/heat: keep upwind. Exposure to fire/heat: consider evacuation. Exposure to fire/heat: seal off low-lying areas. Exposure to fire/heat: have neighbourhood close doors and windows.

Firefighting instructions : Dilute toxic gases with water spray. Take account of toxic fire-fighting water. Use water moderately and if possible collect or contain it.

Protection during firefighting : Heat/fire exposure: compressed air/oxygen apparatus.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Protective equipment : Gloves. Face-shield. Corrosion-proof suit. Large spills/in enclosed spaces: compressed air apparatus. Large spills/in enclosed spaces: gas-tight suit. Reactivity hazard: compressed air/oxygen apparatus. Reactivity hazard: gas-tight suit.

Emergency procedures : Mark the danger area. No naked flames. In case of hazardous reactions: keep upwind. In case of reactivity hazard: consider evacuation. Large spills/in confined spaces: consider evacuation. Wash contaminated clothes.

6.1.2. For emergency responders

Protective equipment : Equip cleanup crew with proper protection.

Emergency procedures : Stop leak if safe to do so. Ventilate area.

6.2. Environmental precautions

Prevent soil and water pollution. Prevent spreading in sewers.

6.3. Methods and material for containment and cleaning up

For containment : Contain released substance, pump into suitable containers. Consult "Material-handling" to select material of containers. Plug the leak, cut off the supply. Dam up the liquid spill. Hazardous reaction: measure explosive gas-air mixture. If reacting: dilute combustible/toxic gases/vapours. Take account of toxic/corrosive precipitation water. Heat exposure: dilute toxic gas/vapour with water spray.

Methods for cleaning up : Liquid spill: neutralize with soda (sodium carbonate). Neutralized substance: take up in absorbent material. Scoop absorbed substance into closing containers. Damaged/cooled tanks must be emptied. Carefully collect the spill/leftovers. Take collected spill to manufacturer/competent authority. Clean contaminated surfaces with an excess of water. Wash clothing and equipment after handling.

6.4. Reference to other sections

No additional information available

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : Comply with the legal requirements. Remove contaminated clothing immediately. Clean contaminated clothing. Thoroughly clean/dry the installation before use. Do not discharge the waste into the drain. Keep away from naked flames/heat. Observe strict hygiene. Keep container tightly closed. Measure the concentration in the air regularly. Carry operations in the open/under local exhaust/ventilation or with respiratory protection.

Hygiene measures : Do not eat, drink or smoke when using this product. Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Wash contaminated clothing before reuse.

7.2. Conditions for safe storage, including any incompatibilities

Incompatible products : Strong bases. metals. cyanides.

Storage temperature : 2 - 25 °C

Heat and ignition sources	:	KEEP SUBSTANCE AWAY FROM: heat sources.
Prohibitions on mixed storage	:	KEEP SUBSTANCE AWAY FROM: oxidizing agents. (strong) bases. metals. amines.
Storage area	:	Ventilation at floor level. Keep locked up. Provide for a tub to collect spills. Meet the legal requirements.
Special rules on packaging	:	SPECIAL REQUIREMENTS: closing. corrosion-proof. clean. correctly labelled. meet the legal requirements. Secure fragile packagings in solid containers.
Packaging materials	:	MATERIAL TO AVOID: steel. metal.

7.3. Specific end use(s)

No additional information available

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Hydrochloric Acid, 37% w/w (7647-01-0)		
USA ACGIH	ACGIH Ceiling (mg/m³)	2.98 mg/m³
USA ACGIH	ACGIH Ceiling (ppm)	2 ppm
USA OSHA	OSHA PEL (Ceiling) (mg/m³)	7 mg/m³
USA OSHA	OSHA PEL (Ceiling) (ppm)	5 ppm

Hydrogen Chloride (7647-01-0)		
USA ACGIH	ACGIH Ceiling (mg/m³)	2.98 mg/m³
USA ACGIH	ACGIH Ceiling (ppm)	2 ppm
USA OSHA	OSHA PEL (Ceiling) (mg/m³)	7 mg/m³
USA OSHA	OSHA PEL (Ceiling) (ppm)	5 ppm

8.2. Exposure controls

Appropriate engineering controls	:	Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.
Materials for protective clothing	:	GIVE GOOD RESISTANCE: natural rubber. nitrile rubber.
Hand protection	:	Gloves.
Eye protection	:	Face shield.
Skin and body protection	:	Corrosion-proof clothing.
Respiratory protection	:	Gas mask with filter type B. Gas mask with filter type E. High vapour/gas concentration: self-contained respirator.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	:	Liquid
Appearance	:	Liquid.
Molecular mass	:	36.46 g/mol
Colour	:	Colourless.
Odour	:	Irritating/pungent odour.
Odour threshold	:	No data available
pH	:	< 1
Relative evaporation rate (butylacetate=1)	:	No data available
Melting point	:	No data available
Freezing point	:	-30 °C
Boiling point	:	No data available
Flash point	:	Not applicable
Self ignition temperature	:	Not applicable
Decomposition temperature	:	No data available
Flammability (solid, gas)	:	No data available
Vapour pressure	:	No data available
Relative vapour density at 20 °C	:	No data available
Relative density	:	1.2

Density : 1190 kg/m^3

Solubility : Soluble in water.
Water: Complete

Log Pow : 0.25 (QSAR)

Log Kow : No data available

Viscosity, kinematic : No data available

Viscosity, dynamic : 0.0023 Pa.s (15 °C)

Explosive properties : Not applicable.

Oxidising properties : None.

Explosive limits : No data available

9.2. Other information

Minimum ignition energy : Not applicable

VOC content : Not applicable

Other properties : Gas/vapour heavier than air at 20°C. Producing fumes/mist. Substance has acid reaction.

SECTION 10: Stability and reactivity

10.1. Reactivity

Decomposes on exposure to temperature rise: release of (highly) toxic gases/vapours (chlorine). On exposure to air: release of corrosive mist. Reacts violently with (some) bases. Reacts exothermically with many compounds. Reacts with (strong) oxidizers: release of (highly) toxic gases/vapours (chlorine). Reacts with (some) metals: release of highly flammable gases/vapours (hydrogen).

10.2. Chemical stability

No data available.

10.3. Possibility of hazardous reactions

Reacts violently with (some) bases: release of heat.

10.4. Conditions to avoid

Incompatible materials.

10.5. Incompatible materials

Strong bases. metals. cyanides. silver nitrate.

10.6. Hazardous decomposition products

Hydrogen chloride.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Harmful if swallowed.

Hydrochloric Acid, 37% w/w (\f)7647-01-0	
LD50 oral rat	700 mg/kg
LD50 dermal rabbit	5010 mg/kg

Hydrogen Chloride (7647-01-0)	
ATE (gases)	700.000 ppmV/4h

Water (7732-18-5)	
LD50 oral rat	≥ 90000 mg/kg

Skin corrosion/irritation : Causes severe skin burns and eye damage.
pH: < 1

Serious eye damage/irritation : Causes serious eye damage.
pH: < 1

Respiratory or skin sensitisation : Not classified

Germ cell mutagenicity : Not classified

Carcinogenicity : Not classified

Hydrochloric Acid, 37% w/w (7647-01-0)	
IARC group	3 - Not classifiable

Reproductive toxicity : Not classified

Specific target organ toxicity (single exposure)	: May cause respiratory irritation.
Specific target organ toxicity (repeated exposure)	: Not classified
Aspiration hazard	: Not classified
Symptoms/injuries after inhalation	: Dry/sore throat. Coughing. Irritation of the respiratory tract. Irritation of the nasal mucous membranes. EXPOSURE TO HIGH CONCENTRATIONS: Respiratory difficulties. Possible laryngeal spasm/oedema. Corrosion of the upper respiratory tract. FOLLOWING SYMPTOMS MAY APPEAR LATER: Risk of pneumonia. Risk of lung oedema.
Symptoms/injuries after skin contact	: Caustic burns/corrosion of the skin.
Symptoms/injuries after eye contact	: Corrosion of the eye tissue. Permanent eye damage.
Symptoms/injuries after ingestion	: Burns to the gastric/intestinal mucosa. Blood in vomit. Possible esophageal perforation. Shock.

SECTION 12: Ecological information

12.1. Toxicity

Ecology - water	: Mild water pollutant (surface water). Ground water pollutant. Maximum concentration in drinking water: 250 mg/l (chloride) (Directive 98/83/EC). Slightly harmful to fishes. Toxic to plankton. pH shift. Insufficient data available on ecotoxicity.

Hydrochloric Acid, 37% w/w (7647-01-0)	
LC50 fishes 1	282 mg/l (96 h; Gambusia affinis; Pure substance)
EC50 Daphnia 1	< 56 mg/l (72 h; Daphnia magna; Pure substance)
LC50 fish 2	862 mg/l (Leuciscus idus; Pure substance)
TLM fish 1	282 ppm (96 h; Gambusia affinis; Pure substance)

12.2. Persistence and degradability

Hydrochloric Acid, 37% w/w (7647-01-0)	
Persistence and degradability	Biodegradability: not applicable. No (test)data on mobility of the components of the mixture available.
Biochemical oxygen demand (BOD)	Not applicable
Chemical oxygen demand (COD)	Not applicable
ThOD	Not applicable
BOD (% of ThOD)	Not applicable

Water (7732-18-5)	
Persistence and degradability	Not established.

12.3. Bioaccumulative potential

Hydrochloric Acid, 37% w/w (7647-01-0)	
Log Pow	0.25 (QSAR)
Bioaccumulative potential	Low potential for bioaccumulation (Log Kow < 4).

Water (7732-18-5)	
Bioaccumulative potential	Not established.

12.4. Mobility in soil

Hydrochloric Acid, 37% w/w (7647-01-0)	
Ecology - soil	May be harmful to plant growth, blooming and fruit formation.

12.5. Other adverse effects

No additional information available

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste disposal recommendations	: Remove waste in accordance with local and/or national regulations. Hazardous waste shall not be mixed together with other waste. Different types of hazardous waste shall not be mixed together if this may entail a risk of pollution or create problems for the further management of the waste. Hazardous waste shall be managed responsibly. All entities that store, transport or handle hazardous waste shall take the necessary measures to prevent risks of pollution or damage to people or animals. Recycle by distillation. Dehydrate/make insoluble. Immobilize the toxic or harmful components. Remove to an authorized dump (Class I). Treat using the best available techniques before discharge into drains or the aquatic environment.

Additional information	: LWCA (the Netherlands): KGA category 01. Hazardous waste according to Directive 2008/98/EC.

SECTION 14: Transport information

In accordance with DOT

Transport document description	: UN1789 Hydrochloric acid, 8, II
UN-No.(DOT)	: 1789
DOT NA no.	: UN1789
DOT Proper Shipping Name	: Hydrochloric acid
Department of Transportation (DOT) Hazard Classes	: 8 - Class 8 - Corrosive material 49 CFR 173.136
Hazard labels (DOT)	: 8 - Corrosive

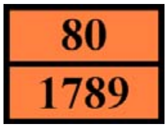
Packing group (DOT)	: II - Medium Danger
DOT Special Provisions (49 CFR 172.102)	: A3 - For combination packagings, if glass inner packagings (including ampoules) are used, they must be packed with absorbent material in tightly closed metal receptacles before packing in outer packagings. A6 - For combination packagings, if plastic inner packagings are used, they must be packed in tightly closed metal receptacles before packing in outer packagings. B3 - MC 300, MC 301, MC 302, MC 303, MC 305, and MC 306 and DOT 406 cargo tanks and DOT 57 portable tanks are not authorized. B15 - Packagings must be protected with non-metallic linings impervious to the lading or have a suitable corrosion allowance. IB2 - Authorized IBCs: Metal (31A, 31B and 31N); Rigid plastics (31H1 and 31H2); Composite (31HZ1). Additional Requirement: Only liquids with a vapor pressure less than or equal to 110 kPa at 50 C (1.1 bar at 122 F), or 130 kPa at 55 C (1.3 bar at 131 F) are authorized. N41 - Metal construction materials are not authorized for any part of a packaging which is normally in contact with the hazardous material. T8 - 4 178.274(d)(2) Normal............ Prohibited TP2 - a. The maximum degree of filling must not exceed the degree of filling determined by the following: (image) Where: tr is the maximum mean bulk temperature during transport, tf is the temperature in degrees celsius of the liquid during filling, and a is the mean coefficient of cubical expansion of the liquid between the mean temperature of the liquid during filling (tf) and the maximum mean bulk temperature during transportation (tr) both in degrees celsius. b. For liquids transported under ambient conditions may be calculated using the formula: (image) Where: d15 and d50 are the densities (in units of mass per unit volume) of the liquid at 15 C (59 F) and 50 C (122 F), respectively. TP12 - This material is considered highly corrosive to steel.
DOT Packaging Exceptions (49 CFR 173.xxx)	: 154
DOT Packaging Non Bulk (49 CFR 173.xxx)	: 202
DOT Packaging Bulk (49 CFR 173.xxx)	: 242
DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27)	: 1 L
DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75)	: 30 L
DOT Vessel Stowage Location	: C - The material must be stowed ‘‘on deck only’’ on a cargo vessel and on a passenger vessel.

Additional information

Other information	: No supplementary information available.
State during transport (ADR-RID)	: as liquid.

ADR

Transport document description	: UN 1789 Hydrochloric acid, 8, II, (E)
Packing group (ADR)	: II
Class (ADR)	: 8 - Corrosive substances
Hazard identification number (Kemler No.)	: 80
Classification code (ADR)	: C1

Danger labels (ADR)	: 8 - Corrosive substances 
Orange plates	: 
Tunnel restriction code	: E

Transport by sea

UN-No. (IMDG)	: 1789
Class (IMDG)	: 8 - Corrosive substances
EmS-No. (1)	: F-A
EmS-No. (2)	: S-B

Air transport

UN-No.(IATA)	: 1789
Class (IATA)	: 8 - Corrosives
Packing group (IATA)	: II - Medium Danger

SECTION 15: Regulatory information

15.1. US Federal regulations

Hydrochloric Acid, 37% w/w (7647-01-0)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory	
RQ (Reportable quantity, section 304 of EPA's List of Lists) :	5000 lb
SARA Section 311/312 Hazard Classes	Immediate (acute) health hazard

Water (7732-18-5)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

15.2. International regulations

CANADA

Hydrochloric Acid, 37% w/w (7647-01-0)	
Listed on the Canadian DSL (Domestic Sustances List) inventory.	
WHMIS Classification	Class E - Corrosive Material

Water (7732-18-5)	
Listed on the Canadian DSL (Domestic Sustances List) inventory.	
WHMIS Classification	Uncontrolled product according to WHMIS classification criteria

EU-Regulations

No additional information available

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Skin Corr. 1B	H314
STOT SE 3	H335

Full text of H-phrases: see section 16

Classification according to Directive 67/548/EEC or 1999/45/EC

C; R34
Xi; R37

Full text of R-phrases: see section 16

15.2.2. National regulations

Hydrochloric Acid, 37% w/w (7647-01-0)
Listed on the Canadian Ingredient Disclosure List

Water (7732-18-5)
Not listed on the Canadian Ingredient Disclosure List

15.3. US State regulations

No additional information available

SECTION 16: Other information

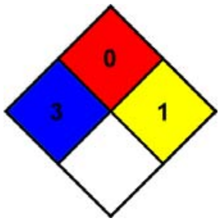
Full text of H-phrases: see section 16:

Acute Tox. 3 (Inhalation)	Acute toxicity (inhal.), Category 3
Acute Tox. 4 (Oral)	Acute toxicity (oral), Category 4
Aquatic Acute 3	Hazardous to the aquatic environment — AcuteHazard, Category 3
Compressed gas	Gases under pressure Compressed gas
Eye Dam. 1	Serious eye damage/eye irritation, Category 1
Skin Corr. 1A	Skin corrosion/irritation, Category 1A
Skin Corr. 1B	Skin corrosion/irritation, Category 1B
STOT SE 3	Specific target organ toxicity — Single exposure, Category 3, Respiratory tract irritation
H280	Contains gas under pressure; may explode if heated
H302	Harmful if swallowed
H314	Causes severe skin burns and eye damage
H318	Causes serious eye damage
H331	Toxic if inhaled
H335	May cause respiratory irritation
H402	Harmful to aquatic life

NFPA health hazard : 3 - Short exposure could cause serious temporary or residual injury even though prompt medical attention was given.

NFPA fire hazard : 0 - Materials that will not burn.

NFPA reactivity : 1 - Normally stable, but can become unstable at elevated temperatures and pressures or may react with water with some release of energy, but not violently.



HMIS III Rating

Health : 3 Serious Hazard - Major injury likely unless prompt action is taken and medical treatment is given

Flammability : 0 Minimal Hazard

Physical : 1 Slight Hazard

Personal Protection : H

SDS US (GHS HazCom 2012)

Information in this SDS is from available published sources and is believed to be accurate. No warranty, express or implied, is made and LabChem Inc assumes no liability resulting from the use of this SDS. The user must determine suitability of this information for his application.

Fisher Scientific

Part of Thermo Fisher Scientific

Material Safety Data Sheet

Creation Date 12-Mar-2009 **Revision Date** 27-Sep-2011 **Revision Number** 3

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name	**Nitric acid, Trace Metal Grade**
Cat No.	**A509-212; A509-500; A509P212; A509P500; A509SK212**
Synonyms	Azotic acid; Engraver's acid; Aqua fortis
Recommended Use	Laboratory chemicals

Company
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number
CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. HAZARDS IDENTIFICATION

DANGER!

Emergency Overview

Oxidizer: Contact with combustible/organic material may cause fire. Causes severe burns by all exposure routes. May cause pulmonary edema.

Appearance Clear Colorless, Light yellow **Physical State** Liquid **odor** strong Acrid

Target Organs	Eyes, Respiratory system, Skin, Teeth, Kidney, Gastrointestinal tract (GI)

Potential Health Effects

Acute Effects
Principle Routes of Exposure

Eyes	Causes severe burns. May cause blindness or permanent eye damage.
Skin	Causes severe burns. May be harmful in contact with skin.
Inhalation	Causes severe burns. May cause pulmonary edema. May be harmful if inhaled.
Ingestion	Ingestion causes burns of the upper digestive and respiratory tract. May be harmful if swallowed.
Chronic Effects	Chronic exposure to corrosive fumes/gases may cause erosion of the teeth followed by jaw necrosis. Bronchial irritation with chronic cough and frequent attacks of pneumonia are common. Gastrointestinal disturbances may also be seen. May cause adverse kidney effects. Experiments have shown reproductive toxicity effects on laboratory animals.

See Section 11 for additional Toxicological information.

Aggravated Medical Conditions	Preexisting eye disorders. Skin disorders.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Haz/Non-haz

Component	CAS-No	Weight %
Nitric acid	7697-37-2	65 - 70
Water	7732-18-5	30 - 35

4. FIRST AID MEASURES

Eye Contact	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Immediate medical attention is required.
Skin Contact	Wash off immediately with plenty of water for at least 15 minutes. Immediate medical attention is required.
Inhalation	Move to fresh air. If breathing is difficult, give oxygen. Do not use mouth-to-mouth resuscitation if victim ingested or inhaled the substance; induce artificial respiration with a respiratory medical device. Immediate medical attention is required.
Ingestion	Do not induce vomiting. Call a physician or Poison Control Center immediately.
Notes to Physician	Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Flash Point	Not applicable
Method	No information available.
Autoignition Temperature	No information available.
Explosion Limits	
Upper	No data available
Lower	No data available
Suitable Extinguishing Media	Substance is nonflammable; use agent most appropriate to extinguish surrounding fire..
Unsuitable Extinguishing Media	No information available.
Hazardous Combustion Products	No information available.
Sensitivity to mechanical impact	No information available.
Sensitivity to static discharge	No information available.

Specific Hazards Arising from the Chemical
Oxidizer: Contact with combustible/organic material may cause fire. Corrosive Material. Causes severe burns by all exposure routes. Thermal decomposition can lead to release of irritating gases and vapors.

Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear

NFPA	**Health** 4	**Flammability** 0	**Instability** 0	**Physical hazards** OX

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions	Wear self-contained breathing apparatus and protective suit. Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Ensure adequate ventilation. Do not get in eyes, on skin, or on clothing.
Environmental Precautions	Should not be released into the environment.
Methods for Containment and Clean Up	Soak up with inert absorbent material. Keep in suitable and closed containers for disposal. Keep away from clothing and other combustible materials.

7. HANDLING AND STORAGE

Handling	Use only under a chemical fume hood. Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Keep away from clothing and other combustible materials. Do not breathe vapors/dust. Do not ingest. Contents under pressure.
Storage	Keep containers tightly closed in a dry, cool and well-ventilated place. Do not store near combustible materials

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering Measures	Use only under a chemical fume hood. Ensure that eyewash stations and safety showers are close to the workstation location.

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH
Nitric acid	TWA: 2 ppm STEL: 4 ppm	(Vacated) TWA: 2 ppm (Vacated) TWA: 5 mg/m^3 (Vacated) STEL: 4 ppm (Vacated) STEL: 10 mg/m^3 TWA: 2 ppm TWA: 5 mg/m^3	IDLH: 25 ppm TWA: 2 ppm TWA: 5 mg/m^3 STEL: 4 ppm STEL: 10 mg/m^3

Component	Quebec	Mexico OEL (TWA)	Ontario TWAEV
Nitric acid	TWA: 2 ppm TWA: 5.2 mg/m^3 STEL: 4 ppm STEL: 10 mg/m^3	TWA: 2 ppm TWA: 5 mg/m^3 STEL: 4 ppm STEL: 10 mg/m^3	TWA: 2 ppm STEL: 4 ppm

NIOSH IDLH: *Immediately Dangerous to Life or Health*

Personal Protective Equipment

Eye/face Protection	Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin and body protection	Wear appropriate protective gloves and clothing to prevent skin exposure.
Respiratory Protection	Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State	Liquid
Appearance	Clear Colorless, Light yellow
odor	strong Acrid
Odor Threshold	No information available.
pH	1.0 (0.1M)
Vapor Pressure	0.94 kPa (20°C)
Vapor Density	No information available.
Viscosity	No information available.
Boiling Point/Range	120.5°C / 248.9°F
Melting Point/Range	-41°C / -41.8°F
Decomposition temperature	No information available.
Flash Point	Not applicable
Evaporation Rate	No information available.
Specific Gravity	1.40
Solubility	No information available.
log Pow	No data available
Molecular Weight	63.02
Molecular Formula	HNO_3

10. STABILITY AND REACTIVITY

Stability	Oxidizer: Contact with combustible/organic material may cause fire.
Conditions to Avoid	Incompatible products. Combustible material. Excess heat.
Incompatible Materials	Strong bases, Reducing agents, Organic materials, Aldehydes, Alcohols, Cyanides, Metals, Powdered metals, Ammonia
Hazardous Decomposition Products	Nitrogen oxides (NOx)
Hazardous Polymerization	Hazardous polymerization does not occur.
Hazardous Reactions .	None under normal processing..

11. TOXICOLOGICAL INFORMATION

Acute Toxicity

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Nitric acid	Not listed	Not listed	130 mg/m^3 (Rat) 4 h 7 mg/L (Rat) 1 h

Irritation	Causes severe burns by all exposure routes
Toxicologically Synergistic Products	No information available.

Chronic Toxicity

Carcinogenicity	There are no known carcinogenic chemicals in this product
Sensitization	No information available.
Mutagenic Effects	No information available.
Reproductive Effects	Experiments have shown reproductive toxicity effects on laboratory animals.
Developmental Effects	No information available.
Teratogenicity	Teratogenic effects have occurred in experimental animals..
Other Adverse Effects	See actual entry in RTECS for complete information.
Endocrine Disruptor Information	No information available

12. ECOLOGICAL INFORMATION

Ecotoxicity

Do not empty into drains.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Nitric acid	Not listed	72 mg/L LC50 96 h	Not listed	Not listed

Persistence and Degradability	No information available
Bioaccumulation/ Accumulation	No information available
Mobility	.

Component	log Pow
Nitric acid	-2.3

13. DISPOSAL CONSIDERATIONS

Waste Disposal Methods	Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. TRANSPORT INFORMATION

DOT

UN-No	UN2031
Proper Shipping Name	NITRIC ACID
Hazard Class	8
Subsidiary Hazard Class	5.1
Packing Group	II

TDG

UN-No	UN2031
Proper Shipping Name	NITRIC ACID
Hazard Class	8
Subsidiary Hazard Class	5.1
Packing Group	II

IATA

UN-No	UN2031
Proper Shipping Name	NITRIC ACID
Hazard Class	8
Subsidiary Hazard Class	5.1
Packing Group	II

IMDG/IMO

UN-No	UN2031
Proper Shipping Name	NITRIC ACID
Hazard Class	8
Subsidiary Hazard Class	5.1
Packing Group	II

15. REGULATORY INFORMATION

All of the components in the product are on the following Inventory lists:

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	CHINA	KECL
Nitric acid	X	X	-	231-714-2	-		X	X	X	X	X
Water	X	X	-	231-791-2	-		X	-	X	X	X

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.

N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Nitric acid	7697-37-2	65 - 70	1.0

SARA 311/312 Hazardous Categorization

Acute Health Hazard	Yes
Chronic Health Hazard	No
Fire Hazard	No
Sudden Release of Pressure Hazard	No
Reactive Hazard	Yes

Clean Water Act

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Nitric acid	X	1000 lb	-	-

Clean Air Act

Not applicable

OSHA

Component	Specifically Regulated Chemicals	Highly Hazardous Chemicals
Nitric acid	-	TQ: 500 lb

CERCLA

This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Nitric acid	1000 lb	1000 lb

California Proposition 65

This product does not contain any Proposition 65 chemicals.

State Right-to-Know

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Nitric acid	X	X	X	X	X

U.S. Department of Transportation

Reportable Quantity (RQ):	Y
DOT Marine Pollutant	N
DOT Severe Marine Pollutant	N

U.S. Department of Homeland Security

This product contains the following DHS chemicals:

Component	DHS Chemical Facility Anti-Terrorism Standard
Nitric acid	2000 lb STQ

Other International Regulations

Mexico - Grade	No information available

Canada

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Hazard Class

C	Oxidizing materials
E	Corrosive material

16. OTHER INFORMATION

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Tel: (412) 490-8929

Creation Date 12-Mar-2009

Print Date 27-Sep-2011

Revision Summary (M)SDS sections updated 3

Disclaimer

End of MSDS

LabChem
performance through chemistry

Sulfuric Acid, 96% w/w

Safety Data Sheet 75289
according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations
Date of issue: 10/01/1998 Revision date: 06/27/2013 Supersedes: 01/25/2012 Version: 1.0

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product form : Substance
Substance name : Sulfuric Acid, 96% w/w
CAS No : 7664-93-9
Product code : LC25550
Formula : H2SO4
Synonyms : battery acid / brown acid / brown oil of vitriol / dihydrogen sulfate / dipping acid / electrolyte acid / nordhausen acid / oil of vitriol / sulphuric acid
BIG no : 14049

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture : Industrial use
Laboratory chemical
Battery: component

1.3. Details of the supplier of the safety data sheet

LabChem Inc
Jackson's Pointe Commerce Park Building 1000, 1010 Jackson's Pointe Court
Zelienople, PA 16063 - USA
T 412-826-5230 - F 724-473-0647
info@labchem.com - www.labchem.com

1.4. Emergency telephone number

Emergency number : CHEMTREC: 1-800-424-9300 or 011-703-527-3887

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

GHS-US classification

Skin Corr. 1A H314
Eye Dam. 1 H318

2.2. Label elements

GHS-US labelling

Hazard pictograms (GHS-US) :

GHS05

Signal word (GHS-US) : Danger

Hazard statements (GHS-US) : H314 - Causes severe skin burns and eye damage
H318 - Causes serious eye damage

Precautionary statements (GHS-US) : P260 - Do not breathe mist, vapours, spray
P264 - Wash exposed skin thoroughly after handling
P280 - Wear protective gloves, protective clothing, eye protection, face protection
P301+P330+P331 - IF SWALLOWED: Rinse mouth. Do NOT induce vomiting
P303+P361+P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower
P304+P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER/doctor/…
P363 - Wash contaminated clothing before reuse
P405 - Store locked up
P501 - Dispose of contents/container to comply with local, state and federal regulations

2.3. Other hazards

Other hazards not contributing to the classification : None.

2.4. Unknown acute toxicity (GHS-US)

No data available

SECTION 3: Composition/information on ingredients

3.1. Substances

Substance type	: Mono-constituent

Name	Product identifier	%	GHS-US classification
Sulfuric Acid, 96% w/w (Main constituent)	(CAS No) 7664-93-9	96	Skin Corr. 1A, H314 Eye Dam. 1, H318

Full text of H-phrases: see section 16

3.2. Mixture

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general	: Check the vital functions. Unconscious: maintain adequate airway and respiration. Respiratory arrest: artificial respiration or oxygen. Cardiac arrest: perform resuscitation. Victim conscious with laboured breathing: half-seated. Victim in shock: on his back with legs slightly raised. Vomiting: prevent asphyxia/aspiration pneumonia. Prevent cooling by covering the victim (no warming up). Keep watching the victim. Give psychological aid. Keep the victim calm, avoid physical strain. Depending on the victim's condition: doctor/hospital.
First-aid measures after inhalation	: Remove the victim into fresh air. Immediately consult a doctor/medical service.
First-aid measures after skin contact	: Wash immediately with lots of water (15 minutes)/shower. Do not apply (chemical) neutralizing agents. Remove clothing while washing. Do not remove clothing if it sticks to the skin. Cover wounds with sterile bandage. Consult a doctor/medical service. If burned surface > 10%: take victim to hospital.
First-aid measures after eye contact	: Rinse immediately with plenty of water for 15 minutes. Take victim to an ophthalmologist. Do not apply neutralizing agents.
First-aid measures after ingestion	: Rinse mouth with water. Do not induce vomiting. Do not give activated charcoal. Immediately consult a doctor/medical service. Call Poison Information Centre (www.big.be/antigif.htm). Take the container/vomit to the doctor/hospital. Ingestion of large quantities: immediately to hospital. Do not give chemical antidote.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries after inhalation	: Dry/sore throat. Coughing. Irritation of the respiratory tract. Irritation of the nasal mucous membranes. ON CONTINUOUS EXPOSURE/CONTACT: Corrosion of the upper respiratory tract. FOLLOWING SYMPTOMS MAY APPEAR LATER: Possible laryngeal spasm/oedema. Risk of pneumonia. Risk of lung oedema. Respiratory difficulties.
Symptoms/injuries after skin contact	: Caustic burns/corrosion of the skin.
Symptoms/injuries after eye contact	: Corrosion of the eye tissue. Permanent eye damage.
Symptoms/injuries after ingestion	: Nausea. Abdominal pain. Blood in stool. Blood in vomit. Burns to the gastric/intestinal mucosa. AFTER ABSORPTION OF HIGH QUANTITIES: Shock.
Chronic symptoms	: ON CONTINUOUS/REPEATED EXPOSURE/CONTACT: Red skin. Dry skin. Itching. Skin rash/inflammation. Affection/discolouration of the teeth. Inflammation/damage of the eye tissue.

4.3. Indication of any immediate medical attention and special treatment needed

Obtain medical assistance.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Unsuitable extinguishing media	: EXTINGUISHING MEDIA FOR SURROUNDING FIRES: Water. Water spray.

5.2. Special hazards arising from the substance or mixture

Fire hazard	: DIRECT FIRE HAZARD. Non combustible. INDIRECT FIRE HAZARD. Reactions involving a fire hazard: see "Reactivity Hazard".
Explosion hazard	: INDIRECT EXPLOSION HAZARD. Reactions with explosion hazards: see "Reactivity Hazard".
Reactivity	: Violent exothermic reaction with water (moisture): release of corrosive gases/vapours. Reacts on exposure to water (moisture) with (some) metals: release of highly flammable gases/vapours (hydrogen). On heating/burning: release of toxic and corrosive gases/vapours (sulphur oxides). Reacts violently with (some) bases: heat release resulting in increased fire or explosion risk. Reacts with many compounds e.g.: with (strong) reducers, with organic material and with combustible materials: (increased) risk of fire/explosion.

5.3. Advice for firefighters

Precautionary measures fire	: Exposure to fire/heat: keep upwind. Exposure to fire/heat: consider evacuation. Exposure to fire/heat: seal off low-lying areas. Exposure to fire/heat: have neighbourhood close doors and windows.
Firefighting instructions	: Cool tanks/drums with water spray/remove them into safety. When cooling/extinguishing: no water in the substance. Dilute toxic gases with water spray.
Protection during firefighting	: Heat/fire exposure: compressed air/oxygen apparatus.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Protective equipment	:	Gloves. Face-shield. Corrosion-proof suit. Large spills/in enclosed spaces: compressed air apparatus. Large spills/in enclosed spaces: gas-tight suit.
Emergency procedures	:	Mark the danger area. No naked flames. Keep containers closed. Avoid ingress of water in the containers. Wash contaminated clothes. Large spills/in confined spaces: consider evacuation. In case of hazardous reactions: keep upwind. In case of reactivity hazard: consider evacuation.

6.1.2. For emergency responders

Protective equipment	:	Equip cleanup crew with proper protection.
Emergency procedures	:	Stop leak if safe to do so. Ventilate area.

6.2. Environmental precautions

Prevent soil and water pollution. Prevent spreading in sewers.

6.3. Methods and material for containment and cleaning up

For containment	:	Contain released substance, pump into suitable containers. Consult "Material-handling" to select material of containers. Plug the leak, cut off the supply. Dam up the liquid spill. Hazardous reaction: measure explosive gas-air mixture. Reaction: dilute combustible gas/vapour with water curtain. Take account of toxic/corrosive precipitation water. Heat exposure: dilute toxic gas/vapour with water spray.
Methods for cleaning up	:	Take up liquid spill into inert absorbent material, e.g.: dry sand/earth/vermiculite. Scoop absorbed substance into closing containers. Carefully collect the spill/leftovers. Damaged/cooled tanks must be emptied. See "Material-handling" for suitable container materials. Clean contaminated surfaces with an excess of water. Take collected spill to manufacturer/competent authority. Wash clothing and equipment after handling.

6.4. Reference to other sections

No additional information available

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling	:	Comply with the legal requirements. Remove contaminated clothing immediately. Clean contaminated clothing. Keep the substance free from contamination. Thoroughly clean/dry the installation before use. Do not discharge the waste into the drain. Never add water to this product. Never dilute by pouring water to the acid. Always add the acid to the water. Keep away from naked flames/heat. Observe very strict hygiene - avoid contact. Keep container tightly closed. Measure the concentration in the air regularly. Carry operations in the open/under local exhaust/ventilation or with respiratory protection.
Hygiene measures	:	Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Wash contaminated clothing before reuse. Do not eat, drink or smoke when using this product.

7.2. Conditions for safe storage, including any incompatibilities

Incompatible products	:	Strong bases. metals. combustible materials.
Heat and ignition sources	:	KEEP SUBSTANCE AWAY FROM: heat sources.
Prohibitions on mixed storage	:	KEEP SUBSTANCE AWAY FROM: combustible materials. reducing agents. (strong) bases. highly flammable materials. metals. cellulosic materials. organic materials. alcohols. amines. water/moisture.
Storage area	:	Store in a dry area. Ventilation at floor level. Keep locked up. Provide for a tub to collect spills. Unauthorized persons are not admitted. Meet the legal requirements.
Special rules on packaging	:	SPECIAL REQUIREMENTS: closing. dry. clean. correctly labelled. meet the legal requirements. Secure fragile packagings in solid containers.
Packaging materials	:	SUITABLE MATERIAL: stainless steel. carbon steel. polyethylene. polypropylene. glass. stoneware/porcelain. MATERIAL TO AVOID: monel steel. lead. copper. zinc.

7.3. Specific end use(s)

No additional information available

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Sulfuric Acid, 96% w/w (7664-93-9)		
USA ACGIH	ACGIH TWA (mg/m³)	0.2 mg/m³
USA OSHA	OSHA PEL (TWA) (mg/m³)	1 mg/m³

8.2. Exposure controls

Appropriate engineering controls	:	Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Provide adequate general and local exhaust ventilation.

Materials for protective clothing	: GIVE EXCELLENT RESISTANCE: butyl rubber. polyethylene. tetrafluoroethylene. GIVE LESS RESISTANCE: neoprene. PVC. viton. GIVE POOR RESISTANCE: natural rubber. nitrile rubber. PVA.
Hand protection	: Gloves.
Eye protection	: Face shield.
Skin and body protection	: Corrosion-proof clothing.
Respiratory protection	: Gas mask with filter type E at conc. in air > exposure limit.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	: Liquid
Appearance	: Liquid.
Molecular mass	: 98.08 g/mol
Colour	: Pure substance: colourless. Unpurified: yellow to brown.
Odour	: Almost odourless.
Odour threshold	: > 1 mg/m³
pH	: No data available
Relative evaporation rate (butylacetate=1)	: No data available
Melting point	: 10 °C
Freezing point	: No data available
Boiling point	: 288 °C
Flash point	: Not applicable
Self ignition temperature	: No data available
Decomposition temperature	: > 340 °C
Flammability (solid, gas)	: No data available
Vapour pressure	: < 1.0 hPa
Relative vapour density at 20 °C	: 3.4
Relative density	: 1.8
Density	: 1840 kg/m³
Solubility	: Exothermically soluble in water. Soluble in ethanol. Water: Complete
Log Pow	: -2.20 (Estimated value)
Log Kow	: No data available
Viscosity, kinematic	: No data available
Viscosity, dynamic	: No data available
Explosive properties	: No data available.
Oxidising properties	: No data available.
Explosive limits	: No data available

9.2. Other information

VOC content	: Not applicable
Other properties	: Gas/vapour heavier than air at 20°C. Clear. Hygroscopic. Slightly volatile. Substance has acid reaction.

SECTION 10: Stability and reactivity

10.1. Reactivity

Violent exothermic reaction with water (moisture): release of corrosive gases/vapours. Reacts on exposure to water (moisture) with (some) metals: release of highly flammable gases/vapours (hydrogen). On heating/burning: release of toxic and corrosive gases/vapours (sulphur oxides). Reacts violently with (some) bases: heat release resulting in increased fire or explosion risk. Reacts with many compounds e.g.: with (strong) reducers, with organic material and with combustible materials: (increased) risk of fire/explosion.

10.2. Chemical stability

Unstable on exposure to moisture.

10.3. Possibility of hazardous reactions

Reacts violently with water. Reacts violently with (some) bases: release of heat.

10.4. Conditions to avoid

Incompatible materials. Moisture.

10.5. Incompatible materials

Water. Strong bases. Organic compounds. metals. Halogens. cyanides. combustible materials.

10.6. Hazardous decomposition products

Sulfur compounds.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Not classified

Sulfuric Acid, 96% w/w (\f)7664-93-9	
LD50 oral rat	2140 mg/kg bodyweight (Rat; Experimental value,Rat; Experimental value)

Skin corrosion/irritation : Causes severe skin burns and eye damage.

Serious eye damage/irritation : Causes serious eye damage.

Respiratory or skin sensitisation : Not classified

Germ cell mutagenicity : Not classified

Carcinogenicity : Not classified

Sulfuric Acid, 96% w/w (7664-93-9)	
IARC group	1

Reproductive toxicity : Not classified

Specific target organ toxicity (single exposure) : Not classified

Specific target organ toxicity (repeated exposure) : Not classified

Aspiration hazard : Not classified

Symptoms/injuries after inhalation : Dry/sore throat. Coughing. Irritation of the respiratory tract. Irritation of the nasal mucous membranes. ON CONTINUOUS EXPOSURE/CONTACT: Corrosion of the upper respiratory tract. FOLLOWING SYMPTOMS MAY APPEAR LATER: Possible laryngeal spasm/oedema. Risk of pneumonia. Risk of lung oedema. Respiratory difficulties.

Symptoms/injuries after skin contact : Caustic burns/corrosion of the skin.

Symptoms/injuries after eye contact : Corrosion of the eye tissue. Permanent eye damage.

Symptoms/injuries after ingestion : Nausea. Abdominal pain. Blood in stool. Blood in vomit. Burns to the gastric/intestinal mucosa. AFTER ABSORPTION OF HIGH QUANTITIES: Shock.

Chronic symptoms : ON CONTINUOUS/REPEATED EXPOSURE/CONTACT: Red skin. Dry skin. Itching. Skin rash/inflammation. Affection/discolouration of the teeth. Inflammation/damage of the eye tissue.

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : Classification concerning the environment: not applicable.

Ecology - water : Mild water pollutant (surface water). Ground water pollutant. Maximum concentration in drinking water: 250 mg/l (sulfate) (Directive 98/83/EC). Harmful to fishes. Harmful to invertebrates (Daphnia). Toxic to plankton. pH shift. Inhibition of activated sludge.

Sulfuric Acid, 96% w/w (7664-93-9)	
LC50 fishes 1	42 mg/l (96 h; Gambusia affinis)
EC50 Daphnia 1	29 mg/l (24 h; Daphnia magna)
LC50 fish 2	49 mg/l (48 h; Lepomis macrochirus)
TLM fish 1	42 mg/l (96 h; Gambusia affinis)
Threshold limit other aquatic organisms 1	6900 mg/l (24 h; Pseudomonas fluorescens)

12.2. Persistence and degradability

Sulfuric Acid, 96% w/w (7664-93-9)	
Persistence and degradability	Biodegradability: not applicable.
Biochemical oxygen demand (BOD)	Not applicable
Chemical oxygen demand (COD)	Not applicable
ThOD	Not applicable
BOD (% of ThOD)	Not applicable

12.3. Bioaccumulative potential

Sulfuric Acid, 96% w/w (7664-93-9)	
Log Pow	-2.20 (Estimated value)
Bioaccumulative potential	Bioaccumulation: not applicable.

12.4. Mobility in soil

No additional information available

12.5. Other adverse effects

No additional information available

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste disposal recommendations : Remove waste in accordance with local and/or national regulations. Recycle/reuse. Remove for physico-chemical/biological treatment. Remove to an authorized dump (Class I). Treat using the best available techniques before discharge into drains or the aquatic environment. Use appropriate containment to avoid environmental contamination.

Additional information : LWCA (the Netherlands): KGA category 01. Hazardous waste according to Directive 2008/98/EC.

Ecology - waste materials : Avoid release to the environment.

SECTION 14: Transport information

In accordance with DOT

14.1. UN number

UN-No.(DOT) : 1830

DOT NA no. UN1830

14.2. UN proper shipping name

DOT Proper Shipping Name : Sulfuric acid
with more than 51 percent acid

Department of Transportation (DOT) Hazard Classes : 8 - Class 8 - Corrosive material 49 CFR 173.136

Hazard labels (DOT) : 8 - Corrosive substances

Packing group (DOT) : II - Medium Danger

DOT Special Provisions (49 CFR 172.102) : A3 - For combination packagings, if glass inner packagings (including ampoules) are used, they must be packed with absorbent material in tightly closed metal receptacles before packing in outer packagings.
A7 - Steel packagings must be corrosion-resistant or have protection against corrosion.
B3 - MC 300, MC 301, MC 302, MC 303, MC 305, and MC 306 and DOT 406 cargo tanks and DOT 57 portable tanks are not authorized.
B83 - Bottom outlets are prohibited on tank car tanks transporting sulfuric acid in concentrations over 65.25 percent.
B84 - Packagings must be protected with non-metallic linings impervious to the lading or have a suitable corrosion allowance for sulfuric acid or spent sulfuric acid in concentration up to 65.25 percent.
IB2 - Authorized IBCs: Metal (31A, 31B and 31N); Rigid plastics (31H1 and 31H2); Composite (31HZ1). Additional Requirement: Only liquids with a vapor pressure less than or equal to 110 kPa at 50 C (1.1 bar at 122 F), or 130 kPa at 55 C (1.3 bar at 131 F) are authorized.
N34 - Aluminum construction materials are not authorized for any part of a packaging which is normally in contact with the hazardous material.
T8 - 4 178.274(d)(2) Normal............. Prohibited
TP2 - a. The maximum degree of filling must not exceed the degree of filling determined by the following: Degree of filling = 95 / (1 + a (tr - tf)) Where: tr is the maximum mean bulk temperature during transport, tf is the temperature in degrees celsius of the liquid during filling, and is the mean coefficient of cubical expansion of the liquid between the mean temperature of the liquid during filling (tf) and the maximum mean bulk temperature during transportation (tr) both in degrees celsius. b. For liquids transported under ambient conditions may be calculated using the formula: a = (d15 - d50) / 35*d50 Where: d15 and d50 are the densities (in units of mass per unit volume) of the liquid at 15 C (59 F) and 50 C (122 F), respectively.
TP12 - This material is considered highly corrosive to steel.

DOT Packaging Exceptions (49 CFR 173.xxx) : 154

DOT Packaging Non Bulk (49 CFR 173.xxx) : 202

DOT Packaging Bulk (49 CFR 173.xxx) : 242

14.3. Additional information

Other information : No supplementary information available.

State during transport (ADR-RID) : as liquid.

Overland transport

Packing group (ADR) : II

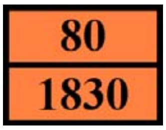
Class (ADR) : 8 - Corrosive substances

Hazard identification number (Kemler No.) : 80

Classification code (ADR) : C1

Danger labels (ADR) : 8 - Corrosive substances

Orange plates :



Tunnel restriction code : E

Transport by sea

DOT Vessel Stowage Location : C - The material must be stowed ‘‘on deck only’’ on a cargo vessel and on a passenger vessel.

DOT Vessel Stowage Other : 14 - For metal drums, stowage permitted under deck on cargo vessels

EmS-No. (1) : F-A

EmS-No. (2) : S-B

Air transport

DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27) : 1 L

DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75) : 30 L

SECTION 15: Regulatory information

15.1. US Federal regulations

Sulfuric Acid, 96% w/w (7664-93-9)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory	
RQ (Reportable quantity, section 304 of EPA's List of Lists) :	1000 lb
SARA Section 311/312 Hazard Classes	Immediate (acute) health hazard

15.2. International regulations

CANADA

Sulfuric Acid, 96% w/w (7664-93-9)	
Listed on the Canadian DSL (Domestic Sustances List) inventory.	
WHMIS Classification	Class E - Corrosive Material

EU-Regulations

No additional information available

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Skin Corr. 1A H314

Full text of H-phrases: see section 16

Classification according to Directive 67/548/EEC or 1999/45/EC

C; R35

Full text of R-phrases: see section 16

15.2.2. National regulations

Sulfuric Acid, 96% w/w (7664-93-9)
Listed on the Canadian Ingredient Disclosure List

15.3. US State regulations

No additional information available

SECTION 16: Other information

Full text of H-phrases: see section 16:

Eye Dam. 1	Serious eye damage/eye irritation, Category 1
Skin Corr. 1A	Skin corrosion/irritation, Category 1A
H314	Causes severe skin burns and eye damage
H318	Causes serious eye damage

NFPA health hazard : 3 - Short exposure could cause serious temporary or residual injury even though prompt medical attention was given.

NFPA fire hazard : 0 - Materials that will not burn.

NFPA reactivity : 2 - Normally unstable and readily undergo violent decomposition but do not detonate. Also: may react violently with water or may form potentially explosive mixtures with water.

NFPA specific hazard : W - Unusual reactivity with water. This indicates a potential hazard using water to fight a fire involving this material. When a compound is both water-reactive and an oxidizer, the W/bar symbol should go in this quadrant and the OX warning is placed immediately below the NFPA diamond.

HMIS III Rating

Health : 3 Serious Hazard - Major injury likely unless prompt action is taken and medical treatment is given

Flammability : 0 Minimal Hazard

Physical : 2 Moderate Hazard

Personal Protection : H

SDS US (GHS HazCom 2012)

Information in this SDS is from available published sources and is believed to be accurate. No warranty, express or implied, is made and LabChem Inc assumes no liability resulting from the use of this SDS. The user must determine suitability of this information for his application.

SAFETY DATA SHEET

1. IDENTIFICATION

Product identifier

Product Name	Buffer Powder Pillows pH 7.00 ± 0.02 @ 25°C

Other means of identification

Product Code(s)	2227095
Safety data sheet number	M00112

Recommended use of the chemical and restrictions on use

Recommended Use	Laboratory reagent. Buffer.
Uses advised against	None.
Restrictions on use	None.

Details of the supplier of the safety data sheet

Manufacturer Address
Hach Company P.O.Box 389 Loveland, CO 80539 USA +1(970) 669-3050

Emergency telephone number
+1(303) 623-5716 - 24 Hour Service

2. HAZARDS IDENTIFICATION

Classification

Regulatory Status
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 2A

Hazards not otherwise classified (HNOC)
Not applicable

Label elements

Signal word
Warning

Hazard statements
H315 - Causes skin irritation
H319 - Causes serious eye irritation

Precautionary statements
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P332 + P313 - If skin irritation occurs: Get medical advice/attention
P362 - Take off contaminated clothing and wash before reuse
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P337 + P313 - If eye irritation persists: Get medical advice/attention

Other Hazards Known
May be harmful if swallowed

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance
Not applicable

Mixture

Chemical name	CAS No.	Percent Range	HMRIC #
Sodium phosphate dibasic	7558-79-4	50 - 60%	-
Phosphoric acid, potassium salt (1:1)	7778-77-0	40 - 50%	-
2,4-Dinitrophenol	51-28-5	<1%	-

4. FIRST AID MEASURES

Description of first aid measures

General advice	Show this safety data sheet to the doctor in attendance.
Inhalation	Remove to fresh air. Get medical attention immediately if symptoms occur.
Eye contact	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Keep eye wide open while rinsing. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if irritation develops and persists. Do not rub affected area.
Skin contact	Wash off immediately with soap and plenty of water for at least 15 minutes. Get medical attention if irritation develops and persists.
Ingestion	Clean mouth with water and drink afterwards plenty of water. Never give anything by mouth to an unconscious person. Do NOT induce vomiting. Call a physician.
Self-protection of the first aider	Avoid contact with skin, eyes or clothing.

Most important symptoms and effects, both acute and delayed

Symptoms	Burning sensation.

Indication of any immediate medical attention and special treatment needed

Note to physicians	Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Unsuitable Extinguishing Media	Caution: Use of water spray when fighting fire may be inefficient.
Specific hazards arising from the chemical	No information available.
Hazardous combustion products	Phosphorus oxides.
Special protective equipment for fire-fighters	Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear. Use personal protection equipment.

6. ACCIDENTAL RELEASE MEASURES

U.S. Notice	Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance. Outside of the US, only persons properly qualified according to state or local regulations should respond to a spill involving chemicals.

Personal precautions, protective equipment and emergency procedures

Personal precautions	Avoid contact with skin, eyes or clothing. Ensure adequate ventilation. Use personal protective equipment as required.
Other Information	Refer to protective measures listed in Sections 7 and 8.

Environmental precautions

Environmental precautions	Prevent further leakage or spillage if safe to do so.

Methods and material for containment and cleaning up

Methods for containment	Prevent further leakage or spillage if safe to do so.
Methods for cleaning up	Pick up and transfer to properly labeled containers.
Prevention of secondary hazards	Clean contaminated objects and areas thoroughly observing environmental regulations.
Reference to other sections	See section 8 for more information. See section 13 for more information.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling	Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes or clothing. Do not eat, drink or smoke when using this product. Take off contaminated clothing and wash before reuse.

Conditions for safe storage, including any incompatibilities

Storage Conditions	Keep containers tightly closed in a dry, cool and well-ventilated place.
Flammability class	Not applicable

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines	This product, as supplied, does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies

Appropriate engineering controls

Engineering Controls	Showers Eyewash stations Ventilation systems.

Individual protection measures, such as personal protective equipment

Respiratory protection	No protective equipment is needed under normal use conditions. If exposure limits are exceeded or irritation is experienced, ventilation and evacuation may be required.
Hand Protection	Wear suitable gloves. Impervious gloves.
Eye/face protection	If splashes are likely to occur, wear safety glasses with side-shields.
Skin and body protection	Wear suitable protective clothing. Long sleeved clothing.
General Hygiene Considerations	Wear suitable gloves and eye/face protection. Do not eat, drink or smoke when using this product. Avoid contact with skin, eyes or clothing.
Environmental exposure controls	Local authorities should be advised if significant spillages cannot be contained. Do not allow into any sewer, on the ground or into any body of water.
Thermal hazards	None under normal processing.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state Solid

Appearance	powder	**Color**	light yellow
Odor	Not determined	**Odor threshold**	No data available

Property	Values	Remarks • Method
Molecular weight	No data available	
pH	7	15.8% Solution
Melting point/freezing point	~ 160 °C / 320 °F	
Boiling point / boiling range	No data available	
Evaporation rate	Not applicable	
Vapor pressure	Not applicable	
Vapor density (air = 1)	Not applicable	
Specific gravity (water = 1 / air = 1)	2.40	
Partition Coefficient (n-octanol/water)	log K_{ow} ~ 0	

Soil Organic Carbon-Water Partition Coefficient	log K_{oc} ~ 0
Autoignition temperature	No data available
Decomposition temperature	No data available
Dynamic viscosity	Not applicable
Kinematic viscosity	Not applicable

Solubility(ies)

Water solubility

Water solubility classification	Water solubility	Water Solubility Temperature
Soluble	> 1000 mg/L	25 °C / 77 °F

Solubility in other solvents

Chemical Name	Solubility classification	Solubility	Solubility Temperature
None reported	No information available	No data available	No information available

Other Information

Metal Corrosivity

Steel Corrosion Rate	Not applicable
Aluminum Corrosion Rate	Not applicable

Volatile Organic Compounds (VOC) Content
Not applicable

Chemical name	CAS No.	Volatile organic compounds (VOC) content	CAA (Clean Air Act)
Sodium phosphate dibasic	7558-79-4	No data available	-
Phosphoric acid, potassium salt (1:1)	7778-77-0	No data available	-
2,4-Dinitrophenol	51-28-5	No data available	X

Explosive properties

Upper explosion limit	No data available
Lower explosion limit	No data available

Flammable properties

Flash point	Not applicable

Flammability Limit in Air

Upper flammability limit	No data available
Lower flammability limit	No data available

Oxidizing properties	No data available.
Bulk density	No data available

10. STABILITY AND REACTIVITY

Reactivity
Not applicable.

Chemical stability
Stable under normal conditions.

Explosion data

Sensitivity to Mechanical Impact	None.
Sensitivity to Static Discharge	None.

Possibility of Hazardous Reactions
None under normal processing.

Hazardous polymerization
None under normal processing.

Conditions to avoid
None known based on information supplied.

Incompatible materials
Strong acids. Strong bases. Strong oxidizing agents.

Hazardous Decomposition Products
Phosphorus oxides.

11. TOXICOLOGICAL INFORMATION

Information on Likely Routes of Exposure

Product Information

Inhalation	May cause irritation of respiratory tract.
Eye contact	Irritating to eyes. Causes serious eye irritation.
Skin contact	Causes skin irritation.
Ingestion	Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.
Symptoms	Redness. May cause redness and tearing of the eyes.

Acute toxicity
Based on available data, the classification criteria are not met

Product Acute Toxicity Data
No data available.

Ingredient Acute Toxicity Data
No data available.

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Phosphoric acid, potassium salt (1:1) (40 - 50%) CAS#: 7778-77-0	Mouse LD_{50}	1700 mg/kg	None reported	None reported	IUCLID (The International Uniform Chemical Information Database)

Unknown Acute Toxicity
0% of the mixture consists of ingredient(s) of unknown toxicity.

Acute Toxicity Estimations (ATE)

The following values are calculated based on chapter 3.1 of the GHS document

ATEmix (oral)	3,885.00 mg/kg
ATEmix (dermal)	No information available
ATEmix (inhalation-dust/mist)	501.00 mg/L
ATEmix (inhalation-vapor)	No information available
ATEmix (inhalation-gas)	No information available

Skin corrosion/irritation

Classification based on data available for ingredients. Irritating to skin.

Product Skin Corrosion/Irritation Data

No data available.

Ingredient Skin Corrosion/Irritation Data

No data available.

Chemical name	Test method	Species	Reported dose	Exposure time	Results	Key literature references and sources for data
Sodium phosphate dibasic (50 - 60%) CAS#: 7558-79-4	Standard Draize Test	Rabbit	500 mg	24 hours	Skin irritant	RTECS (Registry of Toxic Effects of Chemical Substances)
2,4-Dinitrophenol (<1%) CAS#: 51-28-5	Standard Draize Test	Rabbit	300 mg	4 weeks	Mild skin irritant	RTECS (Registry of Toxic Effects of Chemical Substances)

Serious eye damage/irritation

Classification based on data available for ingredients. Irritating to eyes.

Product Serious Eye Damage/Eye Irritation Data

No data available.

Ingredient Eye Damage/Eye Irritation Data

No data available.

Chemical name	Test method	Species	Reported dose	Exposure time	Results	Key literature references and sources for data
Sodium phosphate dibasic (50 - 60%) CAS#: 7558-79-4	Standard Draize Test	Rabbit	500 mg	24 hours	Eye irritant	RTECS (Registry of Toxic Effects of Chemical Substances)

Respiratory or skin sensitization

Based on available data, the classification criteria are not met.

Product Sensitization Data

No data available.

Ingredient Sensitization Data

No data available.

STOT - single exposure

Based on available data, the classification criteria are not met.

Product Specific Target Organ Toxicity Single Exposure Data

No data available.

Ingredient Specific Target Organ Toxicity Single Exposure Data
No data available.

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
2,4-Dinitrophenol (<1%) CAS#: 51-28-5	Human LD_{Lo}	36 mg/kg	None reported	**Behavioral** Coma **Cardiac** Pulse rate increase without fall in BP **Nutritional and Gross Metabolic** Hyperthermia	RTECS (Registry of Toxic Effects of Chemical Substances)
Chemical name	**Endpoint type**	**Reported dose**	**Exposure time**	**Toxicological effects**	**Key literature references and sources for data**
2,4-Dinitrophenol (<1%) CAS#: 51-28-5	Guinea pig TD_{Lo}	700 mg/kg	None reported	None reported	RTECS (Registry of Toxic Effects of Chemical Substances)

STOT - repeated exposure
Based on available data, the classification criteria are not met.

Product Specific Target Organ Toxicity Repeat Dose Data
No data available.

Ingredient Specific Target Organ Toxicity Repeat Exposure Data
No data available.

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
2,4-Dinitrophenol (<1%) CAS#: 51-28-5	Rat TD_{Lo}	540 mg/kg	18 days	**Behavioral** Somnolence (general depressed activity) Convulsions or effect on seizure threshold Death	RTECS (Registry of Toxic Effects of Chemical Substances)

Carcinogenicity
Based on available data, the classification criteria are not met.

Product Carcinogenicity Data
No data available.

Ingredient Carcinogenicity Data
No data available.

Chemical name	CAS No.	ACGIH	IARC	NTP	OSHA
Sodium phosphate dibasic	7558-79-4	-	-	-	-
Phosphoric acid, potassium salt (1:1)	7778-77-0	-	-	-	-
2,4-Dinitrophenol	51-28-5	-	-	-	-

Legend

ACGIH (American Conference of Governmental Industrial Hygienists)	Does not apply
IARC (International Agency for Research on Cancer)	Does not apply
NTP (National Toxicology Program)	Does not apply
OSHA (Occupational Safety and Health Administration of the US Department of Labor)	Does not apply

Germ cell mutagenicity

Based on available data, the classification criteria are not met.

Product Germ Cell Mutagenicity *invitro* Data

No data available.

Ingredient Germ Cell Mutagenicity *invitro* Data

No data available.

Chemical name	Test	Cell Strain	Reported dose	Exposure time	Results	Key literature references and sources for data
2,4-Dinitrophenol (<1%) CAS#: 51-28-5	DNA damage	Rat liver	0.1 mmol/L	None reported	Positive test result for mutagenicity	RTECS (Registry of Toxic Effects of Chemical Substances)

Product Germ Cell Mutagenicity *invivo* Data

No data available.

Ingredient Germ Cell Mutagenicity *invivo* Data

No data available.

Chemical name	Test	Species	Reported dose	Exposure time	Results	Key literature references and sources for data
2,4-Dinitrophenol (<1%) CAS#: 51-28-5	DNA damage	Mouse	50 mg/L	3 hours	Positive test result for mutagenicity	RTECS (Registry of Toxic Effects of Chemical Substances)

Reproductive toxicity

Based on available data, the classification criteria are not met.

Product Reproductive Toxicity Data

No data available.

Ingredient Reproductive Toxicity Data

No data available.

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
2,4-Dinitrophenol (<1%) CAS#: 51-28-5	Rat TD_{Lo}	2040 mg/kg	21 days	**Effects on Newborn** Stillbirth Weaning or lactation index (e.g. # alive at weaning per # alive at day 4)	RTECS (Registry of Toxic Effects of Chemical Substances)

Aspiration hazard

Based on available data, the classification criteria are not met.

12. ECOLOGICAL INFORMATION

Ecotoxicity	.
Unknown aquatic toxicity	0% of the mixture consists of components(s) of unknown hazards to the aquatic environment.

Product Ecological Data

Aquatic Acute Toxicity

No data available.

Aquatic Chronic Toxicity
No data available.

Ingredient Ecological Data

Aquatic Acute Toxicity
No data available.

Chemical name	Exposure time	Species	Endpoint type	Reported dose	Key literature references and sources for data
2,4-Dinitrophenol (<1%) CAS#: 51-28-5	96 hours	None reported	LC_{50}	0.39 mg/L	RTECS (Registry of Toxic Effects of Chemical Substances)

Chemical name	Exposure time	Species	Endpoint type	Reported dose	Key literature references and sources for data
2,4-Dinitrophenol (<1%) CAS#: 51-28-5	96 hours	None reported	EC_{50}	10.9 mg/L	RTECS (Registry of Toxic Effects of Chemical Substances)

Aquatic Chronic Toxicity
No data available.

Persistence and degradability

Product Biodegradability Data
No data available.

Bioaccumulation

Product Bioaccumulation Data
No data available.

Partition Coefficient (n-octanol/water) log K_{ow} ~ 0

Mobility

Soil Organic Carbon-Water Partition Coefficient log K_{oc} ~ 0

Other adverse effects
No information available.

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations. Dispose of waste in accordance with environmental legislation.

Contaminated packaging Do not reuse empty containers.

US EPA Waste Number P048

Chemical name	RCRA	RCRA - Basis for Listing	RCRA - D Series Wastes	RCRA - U Series Wastes
2,4-Dinitrophenol 51-28-5	P048	Included in waste streams: F039, K001	-	-

Chemical name	RCRA - Halogenated Organic Compounds	RCRA - P Series Wastes	RCRA - F Series Wastes	RCRA - K Series Wastes
2,4-Dinitrophenol	-	P048	-	-

51-28-5				

Special instructions for disposal Dilute to 3 to 5 times the volume with cold water. Open cold water tap completely, slowly pour the material to the drain. Allow cold water to run for 5 minutes to completely flush the system.

14. TRANSPORT INFORMATION

DOT	Not regulated
TDG	Not regulated
IATA	Not regulated
IMDG	Not regulated
Note:	No special precautions necessary.

Additional information
There is a possibility that this product could be contained in a reagent set or kit composed of various compatible dangerous goods.
If the item is not in a reagent set or kit, the classification given above applies.
If the item is part of a reagent set or kit the classification would change to the following:
UN3316 Chemical Kit, Hazard Class 9, Packing Group II or III.
If the item is not regulated, the Chemical Kit classification does not apply.

15. REGULATORY INFORMATION

National Inventories

TSCA	Complies
DSL/NDSL	Complies

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

International Inventories

EINECS/ELINCS	Complies
ENCS	Complies
IECSC	Complies
KECL	Complies
PICCS	Complies
TCSI	Complies
AICS	Complies
NZIoC	Complies

EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances
ENCS - Japan Existing and New Chemical Substances
IECSC - China Inventory of Existing Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances
TCSI - Taiwan Chemical Substances Inventory
AICS - Australian Inventory of Chemical Substances
NZIoC - New Zealand Inventory of Chemicals

US Federal Regulations

SARA 313
Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

Chemical name	SARA 313 - Threshold Values %

2,4-Dinitrophenol (CAS #: 51-28-5)	1.0

SARA 311/312 Hazard Categories

Acute health hazard	Yes
Chronic Health Hazard	No
Fire hazard	No
Sudden release of pressure hazard	No
Reactive Hazard	No

CWA (Clean Water Act)

This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

Chemical name	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants	CWA - Hazardous Substances
Sodium phosphate dibasic 7558-79-4	5000 lb	-	-	X
2,4-Dinitrophenol 51-28-5	-	X	X	X

CERCLA

This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material

Chemical name	Hazardous Substances RQs	CERCLA/SARA RQ	Reportable Quantity (RQ)
Sodium phosphate dibasic 7558-79-4	5000 lb	-	RQ 5000 lb final RQ RQ 2270 kg final RQ
2,4-Dinitrophenol 51-28-5	10 lb	-	RQ 10 lb final RQ RQ 4.54 kg final RQ

US State Regulations

California Proposition 65

This product does not contain any Proposition 65 chemicals

U.S. State Right-to-Know Regulations

This product does not contain any substances regulated by state right-to-know regulations.

Chemical name	New Jersey	Massachusetts	Pennsylvania
Sodium phosphate dibasic 7558-79-4	X	X	X
2,4-Dinitrophenol 51-28-5	X	X	X

U.S. EPA Label Information

Chemical name	FIFRA	FDA
Sodium phosphate dibasic	180.0910	21 CFR 182.1778,21 CFR 182.6290,21 CFR 182.6778,21 CFR 182.8778
Phosphoric acid, potassium salt (1:1)	180.0920	-

16. OTHER INFORMATION, INCLUDING DATE OF PREPARATION OF THE LAST REVISION

Special Comments

None

Additional information

Global Automotive Declarable Substance List (GADSL)
Not applicable

NFPA and HMIS Classifications

NFPA	**Health hazards** - 2	**Flammability** - 0	**Instability** - 0	**Physical and chemical properties** -
HMIS	**Health hazards** - 2	**Flammability** - 0	**Physical hazards** - 0	**Personal protection** - X

Key or legend to abbreviations and acronyms used in the safety data sheet

NIOSH IDLH	*Immediately Dangerous to Life or Health*
ACGIH	ACGIH (American Conference of Governmental Industrial Hygienists)
NDF	*no data*

Legend - Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
MAC	Maximum Allowable Concentration	Ceiling	Ceiling Limit Value
X	Listed	Vacated	These values have no official status. The only binding levels of contaminants are those listed in the final OSHA PEL. These lists are for reference purposes only. Please note that some reference state regulations of these "liberated" exposure limits in their state regulations.
SKN*	Skin designation	SKN+	Skin sensitization
RSP+	Respiratory sensitization	**	Hazard Designation
C	Carcinogen	R	Reproductive toxicant
M	mutagen		

Prepared By	Hach Product Compliance Department
Issue Date	30-Aug-2019
Revision Date	30-Aug-2019
Revision Note	None

Disclaimer

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

THE INFORMATION CONTAINED HEREIN IS BASED ON DATA CONSIDERED TO BE ACCURATE. HOWEVER, NO WARRANTY IS EXPRESSED OR IMPLIED REGARDING THE ACCURACY OF THESE DATA OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF.

End of Safety Data Sheet

SAFETY DATA SHEET

Issue Date 02-Jul-2018 **Revision Date** 17-Aug-2018 **Version** 3.2 **Page** 1 / 15

1. IDENTIFICATION

Product identifier

Product Name	Buffer Solution (Wash Water) for Detergents

Other means of identification

Product Code(s)	99949
Safety data sheet number	M00828
UN/ID no	UN3264

Recommended use of the chemical and restrictions on use

Recommended Use	Laboratory Use. Buffer.
Uses advised against	None.
Restrictions on use	None.

Details of the supplier of the safety data sheet

Manufacturer Address
Hach Company P.O.Box 389 Loveland, CO 80539 USA +1(970) 669-3050

Emergency telephone number
+1(303) 623-5716 - 24 Hour Service +1(515)232-2533 - 8am - 4pm CST

2. HAZARDS IDENTIFICATION

Classification

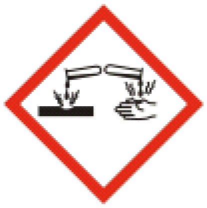
Regulatory Status
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Corrosive to metals	Category 1
Skin corrosion/irritation	Category 1
Serious eye damage/eye irritation	Category 1

Hazards not otherwise classified (HNOC)
Not applicable

Label elements

Signal word - Danger



Hazard statements

H290 - May be corrosive to metals
H314 - Causes severe skin burns and eye damage

Precautionary statements
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P301 + P330 + P331 - IF SWALLOWED: rinse mouth. Do NOT induce vomiting
P303 + P361 + P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
P363 - Wash contaminated clothing before reuse
P405 - Store locked up
P501 - Dispose of contents/ container to an approved waste disposal plant
P234 - Keep only in original container
P390 - Absorb spillage to prevent material damage

Other Hazards Known
Not applicable

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance
Not applicable

Mixture

Percent ranges are used where confidential product information is applicable.

Chemical name	CAS No.	Percent Range	HMRIC #
Sulfuric acid	7664-93-9	1 - 5%	-

4. FIRST AID MEASURES

Description of first aid measures

General advice	Show this safety data sheet to the doctor in attendance. Immediate medical attention is required.
Inhalation	Remove to fresh air. If breathing has stopped, give artificial respiration. Get medical attention immediately. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. If breathing is difficult, (trained personnel should) give oxygen. Delayed pulmonary edema may occur. Get immediate medical advice/attention.
Eye contact	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.

	Remove contact lenses, if present and easy to do. Continue rinsing. Keep eye wide open while rinsing. Do not rub affected area. Get immediate medical advice/attention.
Skin contact	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get immediate medical advice/attention.
Ingestion	Clean mouth with water and drink afterwards plenty of water. Never give anything by mouth to an unconscious person. Do NOT induce vomiting. Get immediate medical advice/attention.
Self-protection of the first aider	Avoid contact with skin, eyes or clothing. Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination. Avoid direct contact with skin. Use barrier to give mouth-to-mouth resuscitation.

Most important symptoms and effects, both acute and delayed

Symptoms	Burning sensation.

Indication of any immediate medical attention and special treatment needed

Note to physicians	Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated. Do not give chemical antidotes. Asphyxia from glottal edema may occur. Marked decrease in blood pressure may occur with moist rales, frothy sputum, and high pulse pressure.

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Unsuitable Extinguishing Media	Caution: Use of water spray when fighting fire may be inefficient.
Specific hazards arising from the chemical	The product causes burns of eyes, skin and mucous membranes. Thermal decomposition can lead to release of irritating gases and vapors.
Hazardous combustion products	This material will not burn.
Special protective equipment for fire-fighters	Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear.

6. ACCIDENTAL RELEASE MEASURES

U.S. Notice	Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance. Outside of the US, only persons properly qualified according to state or local regulations should respond to a spill involving chemicals.

Personal precautions, protective equipment and emergency procedures

Personal precautions	Avoid contact with skin, eyes or clothing. Ensure adequate ventilation. Use personal protective equipment as required. Attention! Corrosive material. Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak.
Other Information	Refer to protective measures listed in Sections 7 and 8.

Environmental precautions

Environmental precautions	Prevent further leakage or spillage if safe to do so. Should not be released into the environment. Do not allow to enter into soil/subsoil. Prevent product from entering drains.

Methods and material for containment and cleaning up

Methods for containment	Prevent further leakage or spillage if safe to do so.
Methods for cleaning up	Pick up and transfer to properly labeled containers.
Prevention of secondary hazards	Clean contaminated objects and areas thoroughly observing environmental regulations.
Reference to other sections	See section 8 for more information. See section 13 for more information.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling	Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes or clothing. In case of insufficient ventilation, wear suitable respiratory equipment. Handle product only in closed system or provide appropriate exhaust ventilation. Do not eat, drink or smoke when using this product. Take off contaminated clothing and wash before reuse.

Conditions for safe storage, including any incompatibilities

Storage Conditions	Keep containers tightly closed in a dry, cool and well-ventilated place. Protect from moisture. Store locked up. Keep out of the reach of children. Store away from other materials.
Flammability class	Not applicable

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines

Chemical name	ACGIH TLV	OSHA PEL	NIOSH IDLH
Sulfuric acid CAS#: 7664-93-9	TWA: 0.2 mg/m^3	TWA: 1 mg/m^3 (vacated) TWA: 1 mg/m^3	IDLH: 15 mg/m^3 TWA: 1 mg/m^3

Appropriate engineering controls

Engineering Controls	Showers Eyewash stations Ventilation systems.

Individual protection measures, such as personal protective equipment

Respiratory protection	No protective equipment is needed under normal use conditions. If exposure limits are exceeded or irritation is experienced, ventilation and evacuation may be required.
Hand Protection	Wear suitable gloves. Impervious gloves.
Eye/face protection	Face protection shield.
Skin and body protection	Wear suitable protective clothing. Long sleeved clothing. Chemical resistant apron.
General Hygiene Considerations	Wear suitable gloves and eye/face protection. Do not eat, drink or smoke when using this

product. Regular cleaning of equipment, work area and clothing is recommended. Avoid contact with skin, eyes or clothing. Remove and wash contaminated clothing and gloves, including the inside, before re-use. Contaminated work clothing should not be allowed out of the workplace. Wash hands before breaks and immediately after handling the product.

Environmental exposure controls	Local authorities should be advised if significant spillages cannot be contained. Do not allow into any sewer, on the ground or into any body of water.
Thermal hazards	None under normal processing.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state Liquid

Appearance	aqueous solution	**Color**	colorless
Odor	None	**Odor threshold**	No data available

Property	Values	Remarks • Method
Molecular weight	No data available	
pH	1.75	
Melting point/freezing point	~ -2 °C / 28 °F	Estimation based on theoretical calculation
Boiling point / boiling range	~ 100 °C / 212 °F	Estimation based on theoretical calculation
Evaporation rate	0.59 (water = 1)	
Vapor pressure	23.552 mm Hg / 3.14 kPa at 25 °C / 77 °F	Estimation based on theoretical calculation
Vapor density (air = 1)	0.62 (air = 1)	
Specific gravity (water = 1 / air = 1)	1.016	
Partition Coefficient (n-octanol/water)	Not applicable	
Soil Organic Carbon-Water Partition Coefficient	Not applicable	
Autoignition temperature	No data available	
Decomposition temperature	No data available	
Dynamic viscosity	No data available	
Kinematic viscosity	No data available	

Solubility(ies)

Water solubility

Water solubility classification	Water solubility	Water Solubility Temperature
Soluble	> 1000 mg/L	25 °C / 77 °F

Solubility in other solvents

Chemical Name	Solubility classification	Solubility	Solubility Temperature
Acid	Soluble	> 1000 mg/L	25 °C / 77 °F

Other Information

Metal Corrosivity
Classified as corrosive to metal according to GHS criteria

Steel Corrosion Rate	7.67 mm/yr / 0.3 in/yr
Aluminum Corrosion Rate	5.84 mm/yr / 0.23 in/yr

Volatile Organic Compounds (VOC) Content

Chemical name	CAS No.	Volatile organic compounds (VOC) content	CAA (Clean Air Act)
Sulfuric acid	7664-93-9	No data available	-

Explosive properties

Upper explosion limit	No data available
Lower explosion limit	No data available

Flammable properties

Flash point	No data available

Flammability Limit in Air

Upper flammability limit	No data available
Lower flammability limit	No data available
Oxidizing properties	No data available.
Bulk density	No data available
Particle Size	No information available
Particle Size Distribution	No information available

10. STABILITY AND REACTIVITY

Reactivity
Not applicable.

Chemical stability
Stability Stable under normal conditions.

Explosion data

Sensitivity to Mechanical Impact	None
Sensitivity to Static Discharge	None.

Possibility of Hazardous Reactions
Possibility of Hazardous Reactions None under normal processing.

Hazardous polymerization
None under normal processing.

Conditions to avoid
Conditions to avoid Exposure to air or moisture over prolonged periods.

Incompatible materials

Incompatible materials	Oxidizing agent. Acids. Bases.

Hazardous Decomposition Products

Thermal decomposition can lead to release of irritating and toxic gases and vapors.

11. TOXICOLOGICAL INFORMATION

Information on Likely Routes of Exposure

Product Information

Inhalation	Corrosive by inhalation. Inhalation of corrosive fumes/gases may cause coughing, choking, headache, dizziness, and weakness for several hours. Pulmonary edema may occur with tightness in the chest, shortness of breath, bluish skin, decreased blood pressure, and increased heart rate. Inhaled corrosive substances can lead to a toxic edema of the lungs. Pulmonary edema can be fatal.
Eye contact	Causes burns. Corrosive to the eyes and may cause severe damage including blindness. Causes serious eye damage. May cause irreversible damage to eyes.
Skin contact	May cause irritation.
Ingestion	Causes burns. Ingestion causes burns of the upper digestive and respiratory tracts. May cause severe burning pain in the mouth and stomach with vomiting and diarrhea of dark blood. Blood pressure may decrease. Brownish or yellowish stains may be seen around the mouth. Swelling of the throat may cause shortness of breath and choking. May cause lung damage if swallowed. May be fatal if swallowed and enters airways.
Symptoms	Redness. Burning. May cause blindness. Coughing and/ or wheezing.
Aggravated Medical Conditions	Eye disorders. Skin disorders. Respiratory disorders. Preexisting eye disorders. Teeth.
Toxicologically synergistic products	None known.
Toxicokinetics, metabolism and distribution	See ingredients information below.

Chemical name	Toxicokinetics, metabolism and distribution
Sulfuric acid (1 - 5%) CAS#: 7664-93-9	The corrosivity of sulfuric acid makes it difficult to assess its effects on metabolism. Its corrosivity is also the main contributor to acute deaths, therefore it is not classified for acute toxicity.

Product Acute Toxicity Data

Oral Exposure Route	No data available
Dermal Exposure Route	No data available
Inhalation (Dust/Mist) Exposure Route	No data available
Inhalation (Vapor) Exposure Route	No data available
Inhalation (Gas) Exposure Route	No data available

Unknown Acute Toxicity

0% of the mixture consists of ingredient(s) of unknown toxicity.

Acute Toxicity Estimations (ATE)

ATEmix (oral)	No information available
ATEmix (dermal)	No information available
ATEmix (inhalation-dust/mist)	No information available
ATEmix (inhalation-vapor)	No information available

ATEmix (inhalation-gas)	No information available

Ingredient Acute Toxicity Data

Oral Exposure Route	If available, see data below
Dermal Exposure Route	If available, see data below
Inhalation (Dust/Mist) Exposure Route	If available, see data below
Inhalation (Vapor) Exposure Route	If available, see data below
Inhalation (Gas) Exposure Route	If available, see data below

Product Specific Target Organ Toxicity Single Exposure Data

Oral Exposure Route	No data available
Dermal Exposure Route	No data available
Inhalation (Dust/Mist) Exposure Route	No data available
Inhalation (Vapor) Exposure Route	No data available
Inhalation (Gas) Exposure Route	No data available

Ingredient Specific Target Organ Toxicity Single Exposure Data

Oral Exposure Route	If available, see data below
Dermal Exposure Route	If available, see data below
Inhalation (Dust/Mist) Exposure Route	If available, see data below
Inhalation (Vapor) Exposure Route	If available, see data below

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Sulfuric acid (1 - 5%) CAS#: 7664-93-9	Human TD_{Lo}	0.144 mg/L	5 minutes	**Lungs, Thorax, or Respiration** Dyspnea	RTECS (Registry of Toxic Effects of Chemical Substances)

Inhalation (Gas) Exposure Route	If available, see data below

Aspiration toxicity

No data available

Product Skin Corrosion/Irritation Data

No data available.

Ingredient Skin Corrosion/Irritation Data

If available, see data below

Chemical name	Test method	Species	Reported dose	Exposure time	Results	Key literature references and sources for data
Sulfuric acid (1 - 5%) CAS#: 7664-93-9	Existing human experience	Human	None reported	None reported	Corrosive to skin	HSDB (Hazardous Substances Data Bank)

Product Serious Eye Damage/Eye Irritation Data

No data available.

Ingredient Eye Damage/Eye Irritation Data

If available, see data below

Chemical name	Test method	Species	Reported dose	Exposure time	Results	Key literature references and sources for data
Sulfuric acid (1 - 5%) CAS#: 7664-93-9	Existing human experience	Human	None reported	None reported	Corrosive to eyes	HSDB (Hazardous Substances Data Bank)

Sensitization Information

Product Sensitization Data

Skin Sensitization Exposure Route	No data available.
Respiratory Sensitization Exposure Route	No data available.

Ingredient Sensitization Data

Skin Sensitization Exposure Route	If available, see data below.
Respiratory Sensitization Exposure Route	If available, see data below.

Chronic Toxicity Information

Product Specific Target Organ Toxicity Repeat Dose Data

Oral Exposure Route	No data available.
Dermal Exposure Route	No data available.
Inhalation (Dust/Mist) Exposure Route	No data available.
Inhalation (Vapor) Exposure Route	No data available.
Inhalation (Gas) Exposure Route	No data available.

Ingredient Specific Target Organ Toxicity Repeat Exposure Data

Oral Exposure Route	If available, see data below
Dermal Exposure Route	If available, see data below
Inhalation (Dust/Mist) Exposure Route	If available, see data below
Inhalation (Vapor) Exposure Route	If available, see data below

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Sulfuric acid (1 - 5%) CAS#: 7664-93-9	Human TC$_{Lo}$	.003 mg/L	168 days	**Musculoskeletal** Changes in teeth and supporting structures	RTECS (Registry of Toxic Effects of Chemical Substances)

Inhalation (Gas) Exposure Route	If available, see data below

Product Carcinogenicity Data

Oral Exposure Route	No data available
Dermal Exposure Route	No data available
Inhalation (Dust/Mist) Exposure Route	No data available
Inhalation (Vapor) Exposure Route	No data available
Inhalation (Gas) Exposure Route	No data available

Ingredient Carcinogenicity Data

Chemical name	CAS No.	ACGIH	IARC	NTP	OSHA
Sulfuric acid	7664-93-9	A2	Group 1	Known	X

Legend

ACGIH (American Conference of Governmental Industrial Hygienists)	A2 - Suspected Human Carcinogen
IARC (International Agency for Research on Cancer)	Group 1 - Carcinogenic to Humans
NTP (National Toxicology Program)	Known - Known Carcinogen
OSHA (Occupational Safety and Health Administration of the US Department of Labor)	X - Present

Oral Exposure Route	If available, see data below
Dermal Exposure Route	If available, see data below
Inhalation (Dust/Mist) Exposure Route	If available, see data below
Inhalation (Vapor) Exposure Route	If available, see data below
Inhalation (Gas) Exposure Route	If available, see data below

Product Germ Cell Mutagenicity *invitro* Data

No data available.

Ingredient Germ Cell Mutagenicity *invitro* Data

If available, see data below

Chemical name	Test	Cell Strain	Reported dose	Exposure time	Results	Key literature references and sources for data
Sulfuric acid (1 - 5%)	Cytogenetic analysis	Hamster ovary	4 mmol/L	None reported	Positive test result for mutagenicity	No information available

CAS#: 7664-93-9						

Product Germ Cell Mutagenicity *invivo* Data

Oral Exposure Route No data available
Dermal Exposure Route No data available
Inhalation (Dust/Mist) Exposure Route No data available
Inhalation (Vapor) Exposure Route No data available
Inhalation (Gas) Exposure Route No data available

Ingredient Germ Cell Mutagenicity *invivo* Data

Oral Exposure Route If available, see data below
Dermal Exposure Route If available, see data below
Inhalation (Dust/Mist) Exposure Route If available, see data below
Inhalation (Vapor) Exposure Route If available, see data below
Inhalation (Gas) Exposure Route If available, see data below

Product Reproductive Toxicity Data

Oral Exposure Route No data available
Dermal Exposure Route No data available
Inhalation (Dust/Mist) Exposure Route No data available
Inhalation (Vapor) Exposure Route No data available
Inhalation (Gas) Exposure Route No data available

Ingredient Reproductive Toxicity Data

Oral Exposure Route If available, see data below
Dermal Exposure Route If available, see data below
Inhalation (Dust/Mist) Exposure Route If available, see data below
Inhalation (Vapor) Exposure Route If available, see data below

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Sulfuric acid (1 - 5%) CAS#: 7664-93-9	Rabbit TC_{Lo}	.02 mg/L	7 hours	**Specific Developmental Abnormalities** Musculoskeletal system	No information available

Inhalation (Gas) Exposure Route If available, see data below

12. ECOLOGICAL INFORMATION

Ecotoxicity

Product Ecological Data

Aquatic toxicity

Fish No data available
Crustacea No data available
Algae No data available

Ingredient Ecological Data

Aquatic toxicity

Fish If available, see ingredient data below
Crustacea If available, see ingredient data below
Algae No data available

Other Information

Persistence and degradability

Product Biodegradability Data
No data available.

Ingredient Biodegradability Data

Bioaccumulation

Product Bioaccumulation Data
No data available.

Partition Coefficient (n-octanol/water)	Not applicable

Ingredient Bioaccumulation Data

Mobility

Soil Organic Carbon-Water Partition Coefficient	Not applicable

Water solubility

Water solubility classification	Water solubility	Water Solubility Temperature
Soluble	> 1000 mg/L	25 °C / 77 °F

Other adverse effects
No information available.

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations. Dispose of waste in accordance with environmental legislation.
Contaminated packaging	Do not reuse empty containers.
US EPA Waste Number	D002
Special instructions for disposal	Dilute to 3 to 5 times the volume with cold water. Adjust to a pH between 6 and 9 with an alkali, such as soda ash or sodium bicarbonate. If permitted by regulation. Open cold water tap completely, slowly pour the reacted material to the drain.

14. TRANSPORT INFORMATION

U.S. DOT

UN/ID no	UN3264
Proper shipping name	Corrosive Liquid, Acidic, Inorganic, N.O.S.
DOT Technical Name	(Sulfuric acid < 3%)
Hazard Class	8
Packing Group	III
Emergency Response Guide Number	154

TDG

UN/ID no	UN3264
Proper shipping name	Corrosive Liquid, Acidic, Inorganic, N.O.S.

TDG Technical Name	(Sulfuric acid < 3%)
Hazard Class	8
Packing Group	III

IATA

UN/ID no	UN3264
Proper shipping name	Corrosive Liquid, Acidic, Inorganic, N.O.S.
IATA Technical Name	(Sulfuric acid < 3%)
Hazard Class	8
Packing Group	III
ERG Code	154

IMDG

UN/ID no	UN3264
IMDG Technical Name	(Sulfuric acid < 3%)
Hazard Class	8
Packing Group	III

Additional information

There is a possibility that this product could be contained in a reagent set or kit composed of various compatible dangerous goods.
If the item is not in a reagent set or kit, the classification given above applies.
If the item is part of a reagent set or kit the classification would change to the following:
UN3316 Chemical Kit, Hazard Class 9, Packing Group II or III.
If the item is not regulated, the Chemical Kit classification does not apply.

15. REGULATORY INFORMATION

National Inventories

TSCA	Complies
DSL/NDSL	Complies

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

International Inventories

EINECS/ELINCS	Complies
ENCS	Complies
IECSC	Complies
KECL	Complies
PICCS	Complies
TCSI	Complies
AICS	Complies
NZIoC	Complies

EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances
ENCS - Japan Existing and New Chemical Substances
IECSC - China Inventory of Existing Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances
TCSI - Taiwan Chemical Substances Inventory
AICS - Australian Inventory of Chemical Substances
NZIoC - New Zealand Inventory of Chemicals

US Federal Regulations

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product contains a chemical or chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

Chemical name	SARA 313 - Threshold Values %
Sulfuric acid (CAS #: 7664-93-9)	1.0

SARA 311/312 Hazard Categories

Acute health hazard	Yes
Chronic Health Hazard	Yes
Fire hazard	No
Sudden release of pressure hazard	No
Reactive Hazard	No

CWA (Clean Water Act)

This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

Chemical name	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants	CWA - Hazardous Substances
Sulfuric acid 7664-93-9	1000 lb	-	-	X

CERCLA

This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material

Chemical name	Hazardous Substances RQs	CERCLA/SARA RQ	Reportable Quantity (RQ)
Sulfuric acid 7664-93-9	1000 lb	1000 lb	RQ 1000 lb final RQ RQ 454 kg final RQ

U.S. - DEA (Drug Enforcement Administration) List I & List II

Chemical name	U.S. - DEA (Drug Enforcement Administration) - List I or Precursor Chemicals	U.S. - DEA (Drug Enforcement Administration) - List II or Essential Chemicals
Sulfuric acid (1 - 5%) CAS#: 7664-93-9	Not Listed	50 gallon Export Volume (exports, transshipments and international transactions to designated countries)

US State Regulations

California Proposition 65

This product contains the following Proposition 65 chemicals

Chemical name	California Proposition 65
Sulfuric acid (CAS #: 7664-93-9)	Carcinogen

⚠**WARNING:** This product can expose you to chemicals including Sulfuric acid, which is known to the State of California to cause cancer.
For more information, go to http://www.P65Warnings.ca.gov

U.S. State Right-to-Know Regulations

Chemical name	New Jersey	Massachusetts	Pennsylvania
Sulfuric acid 7664-93-9	X	X	X

U.S. EPA Label Information

Chemical name	FIFRA	FDA
Sulfuric acid	180.0910	21 CFR 184.1095

16. OTHER INFORMATION, INCLUDING DATE OF PREPARATION OF THE LAST REVISION

Special Comments

None

Additional information

Global Automotive Declarable Substance List (GADSL)
Not applicable

NFPA and HMIS Classifications

NFPA	**Health hazards** - 3	**Flammability** - 0	**Instability** - 0	**Physical and Chemical Properties** -
HMIS	**Health hazards** - 3	**Flammability** - 0	**Physical Hazards** - 0	**Personal protection** - X - See section 8 for more information

Key or legend to abbreviations and acronyms used in the safety data sheet

NIOSH IDLH	*Immediately Dangerous to Life or Health*
ACGIH	ACGIH (American Conference of Governmental Industrial Hygienists)
NDF	*no data*

Legend - Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
MAC	Maximum Allowable Concentration	Ceiling	Ceiling Limit Value
X	Listed	Vacated	These values have no official status. The only binding levels of contaminants are those listed in the final OSHA PEL. These lists are for reference purposes only. Please note that some reference state regulations of these "liberated" exposure limits in their state regulations.
SKN*	Skin designation	SKN+	Skin sensitization
RSP+	Respiratory sensitization	**	Hazard Designation
C	Carcinogen	R	Reproductive toxicant
M	mutagen		

Prepared By	Hach Product Compliance Department
Issue Date	02-Jul-2018
Revision Date	17-Aug-2018
Revision Note	None

Disclaimer

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site

safety programs in accordance with applicable hazard communication standards and regulations.

THE INFORMATION CONTAINED HEREIN IS BASED ON DATA CONSIDERED TO BE ACCURATE. HOWEVER, NO WARRANTY IS EXPRESSED OR IMPLIED REGARDING THE ACCURACY OF THESE DATA OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF.

End of Safety Data Sheet

SAFETY DATA SHEET

Issue Date 09-Jan-2020 **Revision Date** 18-Feb-2020 **Version** 10.3 **Page** 1 / 13

1. IDENTIFICATION

Product identifier

Product Name	Buffer Solution Hardness 1 pH 10.1 ± 0.1

Other means of identification

Product Code(s)	42426
Safety data sheet number	M00305

Recommended use of the chemical and restrictions on use

Recommended Use	Laboratory reagent. Hardness determination.
Uses advised against	None.
Restrictions on use	None.

Details of the supplier of the safety data sheet

Manufacturer Address
Hach Company P.O.Box 389 Loveland, CO 80539 USA +1(970) 669-3050

Emergency telephone number
+1(303) 623-5716 - 24 Hour Service

2. HAZARDS IDENTIFICATION

Classification

Regulatory Status
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 2A
Chronic aquatic toxicity	Category 3

Hazards not otherwise classified (HNOC)
Not applicable

Label elements

Signal word
Warning

Hazard statements
H315 - Causes skin irritation
H319 - Causes serious eye irritation
H412 - Harmful to aquatic life with long lasting effects

Precautionary statements
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P332 + P313 - If skin irritation occurs: Get medical advice/attention
P362 - Take off contaminated clothing and wash before reuse
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P337 + P313 - If eye irritation persists: Get medical advice/attention
P273 - Avoid release to the environment
P501 - Dispose of contents/ container to an approved waste disposal plant

Other Hazards Known
Harmful to aquatic life

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance
Not applicable

Mixture

Chemical Family Mixture.

Chemical name	CAS No.	Percent Range	HMRIC #
2-Amino-2-methyl-1-propanol	124-68-5	40 - 50%	-
Acetic acid	64-19-7	5 - 10%	-

4. FIRST AID MEASURES

Description of first aid measures

General advice	Show this safety data sheet to the doctor in attendance.
Inhalation	Remove to fresh air. Get medical attention immediately if symptoms occur.
Eye contact	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Keep eye wide open while rinsing. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if irritation develops and persists. Do not rub affected area.
Skin contact	Wash off immediately with soap and plenty of water for at least 15 minutes. Get medical attention if irritation develops and persists.
Ingestion	Clean mouth with water and drink afterwards plenty of water. Never give anything by mouth to an unconscious person. Do NOT induce vomiting. Call a physician.
Self-protection of the first aider	Avoid contact with skin, eyes or clothing.

Most important symptoms and effects, both acute and delayed

Symptoms	Burning sensation.

Indication of any immediate medical attention and special treatment needed

Note to physicians	Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Unsuitable Extinguishing Media	Caution: Use of water spray when fighting fire may be inefficient.
Specific hazards arising from the chemical	No information available.
Hazardous combustion products	Nitrogen oxides. Carbon monoxide, Carbon dioxide.
Special protective equipment for fire-fighters	Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear. Use personal protection equipment.

6. ACCIDENTAL RELEASE MEASURES

U.S. Notice	Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance. Outside of the US, only persons properly qualified according to state or local regulations should respond to a spill involving chemicals.

Personal precautions, protective equipment and emergency procedures

Personal precautions	Avoid contact with skin, eyes or clothing. Ensure adequate ventilation. Use personal protective equipment as required.
Other Information	Refer to protective measures listed in Sections 7 and 8.

Environmental precautions

Environmental precautions	Prevent further leakage or spillage if safe to do so.

Methods and material for containment and cleaning up

Methods for containment	Prevent further leakage or spillage if safe to do so.
Methods for cleaning up	Pick up and transfer to properly labeled containers.
Prevention of secondary hazards	Clean contaminated objects and areas thoroughly observing environmental regulations.
Reference to other sections	See section 8 for more information. See section 13 for more information.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes or clothing. Do not eat, drink or smoke when using this product. Take off contaminated clothing and wash before reuse.

Conditions for safe storage, including any incompatibilities

Storage Conditions Keep containers tightly closed in a dry, cool and well-ventilated place.

Flammability class Class IIIB

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines This product, as supplied, does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies

Chemical name	ACGIH TLV	OSHA PEL	NIOSH
Acetic acid CAS#: 64-19-7	STEL: 15 ppm TWA: 10 ppm	TWA: 10 ppm TWA: 25 mg/m^3 (vacated) TWA: 10 ppm (vacated) TWA: 25 mg/m^3	IDLH: 50 ppm TWA: 10 ppm TWA: 25 mg/m^3 STEL: 15 ppm STEL: 37 mg/m^3

Appropriate engineering controls

Engineering Controls Showers
Eyewash stations
Ventilation systems.

Individual protection measures, such as personal protective equipment

Respiratory protection No protective equipment is needed under normal use conditions. If exposure limits are exceeded or irritation is experienced, ventilation and evacuation may be required.

Hand Protection Wear suitable gloves. Impervious gloves.

Eye/face protection If splashes are likely to occur, wear safety glasses with side-shields.

Skin and body protection Wear suitable protective clothing. Long sleeved clothing.

General Hygiene Considerations Wear suitable gloves and eye/face protection. Do not eat, drink or smoke when using this product. Avoid contact with skin, eyes or clothing.

Environmental exposure controls Local authorities should be advised if significant spillages cannot be contained. Do not allow into any sewer, on the ground or into any body of water.

Thermal hazards None under normal processing.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state Liquid
Appearance aqueous solution
Color yellow
Odor Vinegar
Odor threshold No data available

Property	Values	Remarks • Method

Molecular weight	No data available
pH	10.0
Melting point/freezing point	-16 °C / 3 °F
Boiling point / boiling range	104 °C / 219 °F
Evaporation rate	0.97 (water = 1)
Vapor pressure	23.027 mm Hg / 3.07 kPa at 25 °C / 77 °F
Vapor density (air = 1)	0.6
Specific gravity (water = 1 / air = 1)	1.033
Partition Coefficient (n-octanol/water)	Not applicable
Soil Organic Carbon-Water Partition Coefficient	Not applicable
Autoignition temperature	No data available
Decomposition temperature	No data available
Dynamic viscosity	No data available
Kinematic viscosity	No data available

Solubility(ies)

Water solubility

Water solubility classification	Water solubility	Water Solubility Temperature
Soluble	> 1000 mg/L	25 °C / 77 °F

Solubility in other solvents

Chemical Name	Solubility classification	Solubility	Solubility Temperature
Acid	Soluble	> 1000 mg/L	25 °C / 77 °F

Other Information

Metal Corrosivity

Steel Corrosion Rate	0.05 mm/yr / 0 in/yr
Aluminum Corrosion Rate	

Volatile Organic Compounds (VOC) Content

Chemical name	CAS No.	Volatile organic compounds (VOC) content	CAA (Clean Air Act)
2-Amino-2-methyl-1-propanol	124-68-5	No data available	-
Acetic acid	64-19-7	No data available	X

Explosive properties

Upper explosion limit	No data available
Lower explosion limit	No data available

Flammable properties

Flash point	> 97 °C / 207 °F
Method	CC (closed cup)

Flammability Limit in Air

Upper flammability limit	No data available
Lower flammability limit	No data available

Oxidizing properties	No data available.
Bulk density	No data available

10. STABILITY AND REACTIVITY

Reactivity
Not applicable.

Chemical stability
Stable under normal conditions.

Explosion data

Sensitivity to Mechanical Impact	None.
Sensitivity to Static Discharge	None.

Possibility of Hazardous Reactions
None under normal processing.

Hazardous polymerization
None under normal processing.

Conditions to avoid
None known based on information supplied.

Incompatible materials
Strong acids. Strong bases. Strong oxidizing agents.

Hazardous Decomposition Products
Nitrogen oxides. Carbon dioxide. Carbon monoxide.

11. TOXICOLOGICAL INFORMATION

Information on Likely Routes of Exposure

Product Information

Inhalation	May cause irritation of respiratory tract.
Eye contact	Irritating to eyes. Causes serious eye irritation.
Skin contact	Causes skin irritation.
Ingestion	Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.
Symptoms	Redness. May cause redness and tearing of the eyes.

Acute toxicity

Based on available data, the classification criteria are not met

Product Acute Toxicity Data
No data available.

Ingredient Acute Toxicity Data
No data available.

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
2-Amino-2-methyl-1-propanol (40 - 50%) CAS#: 124-68-5	Rat LD_{50}	2900 mg/kg	None reported	None reported	IUCLID (The International Uniform Chemical Information Database)
Acetic acid (5 - 10%) CAS#: 64-19-7	Rat LD_{50}	3310 mg/kg	None reported	None reported	Vendor SDS

Unknown Acute Toxicity
0% of the mixture consists of ingredient(s) of unknown toxicity.

Acute Toxicity Estimations (ATE)

The following values are calculated based on chapter 3.1 of the GHS document

ATEmix (oral)	6,156.00 mg/kg
ATEmix (dermal)	5,307.00 mg/kg
ATEmix (inhalation-dust/mist)	No information available
ATEmix (inhalation-vapor)	No information available
ATEmix (inhalation-gas)	No information available

Skin corrosion/irritation
Classification based on data available for ingredients. Irritating to skin.

Product Skin Corrosion/Irritation Data
No data available.

Ingredient Skin Corrosion/Irritation Data
No data available.

Chemical name	Test method	Species	Reported dose	Exposure time	Results	Key literature references and sources for data
Acetic acid (5 - 10%) CAS#: 64-19-7	Standard Draize Test	Rabbit	0.050 mg	None reported	Corrosive to skin	HSDB (Hazardous Substances Data Bank)

Serious eye damage/irritation
Classification based on data available for ingredients. Irritating to eyes.

Product Serious Eye Damage/Eye Irritation Data
No data available.

Ingredient Eye Damage/Eye Irritation Data
No data available.

Respiratory or skin sensitization
Based on available data, the classification criteria are not met.

Product Sensitization Data
No data available.

Ingredient Sensitization Data
No data available.

Chemical name	Test method	Species	Results	Key literature references and sources for data
2-Amino-2-methyl-1-propanol (40 - 50%) CAS#: 124-68-5	Buehler Test	Guinea pig	Not confirmed to be a skin sensitizer	IUCLID (The International Uniform Chemical Information Database)

STOT - single exposure
Based on available data, the classification criteria are not met.

Product Specific Target Organ Toxicity Single Exposure Data
No data available.

Ingredient Specific Target Organ Toxicity Single Exposure Data
No data available.

STOT - repeated exposure
Based on available data, the classification criteria are not met.

Product Specific Target Organ Toxicity Repeat Dose Data
No data available.

Ingredient Specific Target Organ Toxicity Repeat Exposure Data
No data available.

Carcinogenicity
Based on available data, the classification criteria are not met.

Product Carcinogenicity Data
No data available.

Ingredient Carcinogenicity Data
No data available.

Chemical name	CAS No.	ACGIH	IARC	NTP	OSHA
2-Amino-2-methyl-1-propanol	124-68-5	-	-	-	-
Acetic acid	64-19-7	-	-	-	-

Legend

ACGIH (American Conference of Governmental Industrial Hygienists)	Does not apply
IARC (International Agency for Research on Cancer)	Does not apply
NTP (National Toxicology Program)	Does not apply
OSHA (Occupational Safety and Health Administration of the US Department of Labor)	Does not apply

Germ cell mutagenicity
Based on available data, the classification criteria are not met.

Product Germ Cell Mutagenicity ***invitro*** **Data**
No data available.

Ingredient Germ Cell Mutagenicity ***invitro*** **Data**
No data available.

Chemical name	Test	Cell Strain	Reported	Exposure	Results	Key literature

			dose	**time**		**references and sources for data**
2-Amino-2-methyl-1-propanol (40 - 50%) CAS#: 124-68-5	Mutation in microorganisms	*Salmonella typhimurium*	5 mg/plate	None reported	Negative test result for mutagenicity	ECHA (The European Chemicals Agency)

Product Germ Cell Mutagenicity *invivo* Data
No data available.

Ingredient Germ Cell Mutagenicity *invivo* Data
No data available.

Reproductive toxicity
Based on available data, the classification criteria are not met.

Product Reproductive Toxicity Data
No data available.

Ingredient Reproductive Toxicity Data
No data available.

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
2-Amino-2-methyl-1-propanol (40 - 50%) CAS#: 124-68-5	Rat NOAEL	300 mg/kg	15 days	No reproductive or developmental toxic effects observed	ECHA (The European Chemicals Agency)

Aspiration hazard
Based on available data, the classification criteria are not met.

12. ECOLOGICAL INFORMATION

Ecotoxicity Harmful to aquatic life with long lasting effects.

Unknown aquatic toxicity 0% of the mixture consists of components(s) of unknown hazards to the aquatic environment.

Product Ecological Data

Aquatic Acute Toxicity
No data available.

Aquatic Chronic Toxicity
No data available.

Ingredient Ecological Data

Aquatic Acute Toxicity
No data available.

Chemical name	Exposure time	Species	Endpoint type	Reported dose	Key literature references and sources for data
Acetic acid (5 - 10%) CAS#: 64-19-7	96 hours	*Pimephales promelas*	LC_{50}	79 mg/L	GESTIS (Information System on Hazardous Substances of the German Social Accident Insurance)
Chemical name	**Exposure time**	**Species**	**Endpoint type**	**Reported dose**	**Key literature references and sources for data**
2-Amino-2-methyl-1-propanol	48 Hours	*Daphina magna*	EC_{50}	65 mg/L	ECHA (The European Chemicals Agency)

(40 - 50%) CAS#: 124-68-5					
Acetic acid (5 - 10%) CAS#: 64-19-7	48 Hours	None reported	LC_{50}	90.1 mg/L	GESTIS (Information System on Hazardous Substances of the German Social Accident Insurance)

Aquatic Chronic Toxicity
No data available.

Persistence and degradability

Product Biodegradability Data
No data available.

Bioaccumulation

Product Bioaccumulation Data
No data available.

Partition Coefficient (n-octanol/water) Not applicable

Mobility

Soil Organic Carbon-Water Partition Coefficient Not applicable

Other adverse effects
No information available.

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations. Dispose of waste in accordance with environmental legislation.
Contaminated packaging	Do not reuse empty containers.
Special instructions for disposal	Dilute to 3 to 5 times the volume with cold water. Adjust to a pH between 6 and 9 with an acid, such as sulfuric or citric. If permitted by regulation. Open cold water tap completely, slowly pour the reacted material to the drain. Allow cold water to run for 5 minutes to completely flush the system. Check with national, local municipal and state authorities and waste contractors for pertinent local information on the disposal of this article.

14. TRANSPORT INFORMATION

DOT	Not regulated
TDG	Not regulated
IATA	Not regulated
IMDG	Not regulated
Note:	No special precautions necessary.

Additional information
There is a possibility that this product could be contained in a reagent set or kit composed of various compatible dangerous goods.

If the item is not in a reagent set or kit, the classification given above applies.
If the item is part of a reagent set or kit the classification would change to the following:
UN3316 Chemical Kit, Hazard Class 9, Packing Group II or III.
If the item is not regulated, the Chemical Kit classification does not apply.

15. REGULATORY INFORMATION

National Inventories

TSCA	Complies
DSL/NDSL	Complies

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

International Inventories

EINECS/ELINCS	Complies
ENCS	Complies
IECSC	Complies
KECL	Complies
PICCS	Complies
TCSI	Complies
AICS	Complies
NZIoC	Complies

EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances
ENCS - Japan Existing and New Chemical Substances
IECSC - China Inventory of Existing Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances
TCSI - Taiwan Chemical Substances Inventory
AICS - Australian Inventory of Chemical Substances
NZIoC - New Zealand Inventory of Chemicals

US Federal Regulations

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

SARA 311/312 Hazard Categories

Acute health hazard	Yes
Chronic Health Hazard	No
Fire hazard	No
Sudden release of pressure hazard	No
Reactive Hazard	No

CWA (Clean Water Act)

This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

Chemical name	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants	CWA - Hazardous Substances
Acetic acid 64-19-7	5000 lb	-	-	X

CERCLA

This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material

Chemical name	Hazardous Substances RQs	CERCLA/SARA RQ	Reportable Quantity (RQ)
Acetic acid 64-19-7	5000 lb	-	RQ 5000 lb final RQ RQ 2270 kg final RQ

U.S. - Department of Homeland Security - Chemical Facility Anti-Terrorism Standards (CFATS) - Security Issues

U.S. - DEA (Drug Enforcement Administration) List I & List II

US State Regulations

California Proposition 65
This product does not contain any Proposition 65 chemicals

U.S. State Right-to-Know Regulations

This product does not contain any substances regulated by state right-to-know regulations.

Chemical name	New Jersey	Massachusetts	Pennsylvania
2-Amino-2-methyl-1-propanol 124-68-5	X	X	X
Acetic acid 64-19-7	X	X	X

U.S. EPA Label Information

Chemical name	FIFRA	FDA
Acetic acid	180.0551	21 CFR 184.1005

16. OTHER INFORMATION, INCLUDING DATE OF PREPARATION OF THE LAST REVISION

Special Comments
None

Additional information

Global Automotive Declarable Substance List (GADSL)
Not applicable

NFPA and HMIS Classifications

NFPA	**Health hazards** - 2	**Flammability** - 1	**Instability** - 0	**Physical and chemical properties** -
HMIS	**Health hazards** - 2	**Flammability** - 1	**Physical hazards** - 0	**Personal protection** - X

Key or legend to abbreviations and acronyms used in the safety data sheet

NIOSH IDLH	*Immediately Dangerous to Life or Health*
ACGIH	ACGIH (American Conference of Governmental Industrial Hygienists)
NDF	*no data*

Legend - Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
MAC	Maximum Allowable Concentration	Ceiling	Ceiling Limit Value
X	Listed	Vacated	These values have no official status. The only binding levels of contaminants are those listed in the final OSHA PEL. These lists are

for reference purposes only. Please note that some reference state regulations of these "liberated" exposure limits in their state regulations.

SKN*	Skin designation	SKN+	Skin sensitization
RSP+	Respiratory sensitization	**	Hazard Designation
C	Carcinogen	R	Reproductive toxicant
M	mutagen		

Prepared By Hach Product Compliance Department

Issue Date 09-Jan-2020

Revision Date 18-Feb-2020

Revision Note None

Disclaimer

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

THE INFORMATION CONTAINED HEREIN IS BASED ON DATA CONSIDERED TO BE ACCURATE. HOWEVER, NO WARRANTY IS EXPRESSED OR IMPLIED REGARDING THE ACCURACY OF THESE DATA OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF.

End of Safety Data Sheet

SAFETY DATA SHEET

Issue Date 13-May-2019 **Revision Date** 13-May-2019 **Version** 3

1. IDENTIFICATION

Product identifier

Product Name	Chloroform

Other means of identification

Product Code(s)	1445849
Safety data sheet number	M00190
UN/ID no	UN1888

Recommended use of the chemical and restrictions on use

Recommended Use	Laboratory Use. Solvent.
Uses advised against	Consumer use.
Restrictions on use	For Laboratory Use Only.

Details of the supplier of the safety data sheet

Manufacturer Address
Hach Company P.O.Box 389 Loveland, CO 80539 USA +1(970) 669-3050

Emergency telephone number
+1(303) 623-5716 - 24 Hour Service

2. HAZARDS IDENTIFICATION

Classification

Regulatory Status
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Acute toxicity - Oral	Category 4
Acute toxicity - Inhalation (Dusts/Mists)	Category 3
Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 2A
Carcinogenicity	Category 2
Reproductive toxicity	Category 2
Specific target organ toxicity (repeated exposure)	Category 1
Chronic aquatic toxicity	Category 3

Hazards not otherwise classified (HNOC)
Not applicable

Label elements

Signal word
Danger

Hazard statements
H302 - Harmful if swallowed
H315 - Causes skin irritation
H319 - Causes serious eye irritation
H331 - Toxic if inhaled
H351 - Suspected of causing cancer
H361 - Suspected of damaging fertility or the unborn child
H372 - Causes damage to organs through prolonged or repeated exposure
H412 - Harmful to aquatic life with long lasting effects

Precautionary statements
P270 - Do not eat, drink or smoke when using this product
P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
P330 - Rinse mouth
P501 - Dispose of contents/ container to an approved waste disposal plant
P271 - Use only outdoors or in a well-ventilated area
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P311 - Call a POISON CENTER or doctor/physician
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P405 - Store locked up
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P332 + P313 - If skin irritation occurs: Get medical advice/attention
P362 - Take off contaminated clothing and wash before reuse
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P337 + P313 - If eye irritation persists: Get medical advice/attention
P201 - Obtain special instructions before use
P308 + P313 - IF exposed or concerned: Get medical advice/attention
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P273 - Avoid release to the environment

Other Hazards Known
Harmful to aquatic life

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance

Chemical Name	Chloroform
Chemical Family	Halogenated hydrocarbons.
Formula	$CHCl_3$
CAS No	67-66-3
Chemical nature	Organic solvents and additives.

Percent ranges are used where confidential product information is applicable.

Chemical name	CAS No.	Percent Range	HMRIC #
Chloroform	67-66-3	100%	-

4. FIRST AID MEASURES

Description of first aid measures

General advice	Show this safety data sheet to the doctor in attendance. IF exposed or concerned: Get medical advice/attention.
Inhalation	Remove to fresh air. Get medical attention immediately if symptoms occur. If breathing has stopped, give artificial respiration. Get medical attention immediately. Immediate medical attention is required. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. If breathing is difficult, (trained personnel should) give oxygen.
Eye contact	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Keep eye wide open while rinsing. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if irritation develops and persists. Do not rub affected area.
Skin contact	Wash off immediately with soap and plenty of water for at least 15 minutes. Get medical attention if irritation develops and persists.
Ingestion	Do NOT induce vomiting. Clean mouth with water and drink afterwards plenty of water. Never give anything by mouth to an unconscious person. Call a physician or poison control center immediately.
Self-protection of the first aider	Avoid contact with skin, eyes or clothing. Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Do not breathe vapor or mist.

Most important symptoms and effects, both acute and delayed

Symptoms	Burning sensation. Coughing and/ or wheezing. Difficulty in breathing.

Indication of any immediate medical attention and special treatment needed

Note to physicians	Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Unsuitable Extinguishing Media	Caution: Use of water spray when fighting fire may be inefficient.
Specific hazards arising from the chemical	No information available.
Hazardous combustion products	This material will not burn.
Special protective equipment for fire-fighters	Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear. Use personal protection equipment.

6. ACCIDENTAL RELEASE MEASURES

U.S. Notice	Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance.

Outside of the US, only persons properly qualified according to state or local regulations should respond to a spill involving chemicals.

Personal precautions, protective equipment and emergency procedures

Personal precautions Ensure adequate ventilation. Use personal protective equipment as required. Evacuate personnel to safe areas. Avoid contact with skin, eyes or clothing. Do not breathe vapor or mist. Keep people away from and upwind of spill/leak.

Other Information Refer to protective measures listed in Sections 7 and 8.

Environmental precautions

Environmental precautions Prevent further leakage or spillage if safe to do so.

Methods and material for containment and cleaning up

Methods for containment Prevent further leakage or spillage if safe to do so.

Methods for cleaning up Pick up and transfer to properly labeled containers.

Prevention of secondary hazards Clean contaminated objects and areas thoroughly observing environmental regulations.

Reference to other sections See section 8 for more information. See section 13 for more information.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes or clothing. Do not eat, drink or smoke when using this product. Remove contaminated clothing and shoes. Take off contaminated clothing and wash before reuse. Do not breathe vapor or mist. In case of insufficient ventilation, wear suitable respiratory equipment. Handle product only in closed system or provide appropriate exhaust ventilation.

Conditions for safe storage, including any incompatibilities

Storage Conditions Keep containers tightly closed in a dry, cool and well-ventilated place. Keep out of the reach of children. Store locked up.

Flammability class Not applicable

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines

Chemical name	ACGIH TLV	OSHA PEL	NIOSH
Chloroform CAS#: 67-66-3	TWA: 10 ppm	(vacated) TWA: 2 ppm (vacated) TWA: 9.78 mg/m^3 Ceiling: 50 ppm Ceiling: 240 mg/m^3	IDLH: 500 ppm STEL: 2 ppm 60 min STEL: 9.78 mg/m^3 60 min

Appropriate engineering controls

Engineering Controls Showers
Eyewash stations

Ventilation systems.

Individual protection measures, such as personal protective equipment

Respiratory protection	No protective equipment is needed under normal use conditions. If exposure limits are exceeded or irritation is experienced, ventilation and evacuation may be required.
Hand Protection	Wear suitable gloves. Impervious gloves.
Eye/face protection	If splashes are likely to occur, wear safety glasses with side-shields.
Skin and body protection	Wear suitable protective clothing. Long sleeved clothing.
General Hygiene Considerations	Do not eat, drink or smoke when using this product. Wash hands before breaks and immediately after handling the product. Wear suitable gloves and eye/face protection. Avoid contact with skin, eyes or clothing. Do not breathe vapor or mist. Remove and wash contaminated clothing and gloves, including the inside, before re-use. Contaminated work clothing should not be allowed out of the workplace. Regular cleaning of equipment, work area and clothing is recommended.
Environmental exposure controls	Local authorities should be advised if significant spillages cannot be contained. Do not allow into any sewer, on the ground or into any body of water.
Thermal hazards	None under normal processing.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state Liquid

Appearance	clear	**Color**	colorless
Odor	Ether-like	**Odor threshold**	200 ppm

Property	Values	Remarks • Method
Molecular weight	119.37 g/mole	
pH	No data available	
Melting point/freezing point	-64 °C / -83.2 °F	
Boiling point / boiling range	61 °C / 141.8 °F	
Evaporation rate	0.6 (ether = 1)	
Vapor pressure	159.016 mm Hg / 21.2 kPa at 20 °C / 68 °F	
Vapor density (air = 1)	4.36	
Specific gravity (water = 1 / air = 1)	1.49	
Partition Coefficient (n-octanol/water)	log K_{ow} = 1.97	
Soil Organic Carbon-Water Partition Coefficient	log K_{oc} = 1.71	
Autoignition temperature	No data available	
Decomposition temperature	No data available	
Dynamic viscosity	No data available	
Kinematic viscosity	No data available	

Solubility(ies)

Water solubility

Water solubility classification	Water solubility	Water Solubility Temperature
Soluble	8000 mg/L	20 °C / 68 °F

Solubility in other solvents

Chemical Name	Solubility classification	Solubility	Solubility Temperature
Ethyl alcohol	Soluble	> 1000 mg/L	25 °C / 77 °F
Benzene	Soluble	> 1000 mg/L	25 °C / 77 °F
Carbon disulfide	Soluble	> 1000 mg/L	25 °C / 77 °F
Carbon tetrachloride	Soluble	> 1000 mg/L	25 °C / 77 °F
Ether	Soluble	> 1000 mg/L	25 °C / 77 °F

Other Information

Metal Corrosivity

Steel Corrosion Rate	No data available
Aluminum Corrosion Rate	No data available

Volatile Organic Compounds (VOC) Content
This Product is by Weight 100% an Individual Pure Chemical Substance See ingredients information below

Chemical name	CAS No.	Volatile organic compounds (VOC) content	CAA (Clean Air Act)
Chloroform	67-66-3	100%	X

Explosive properties

Upper explosion limit	Not applicable
Lower explosion limit	Not applicable

Flammable properties

Flash point	No data available

Flammability Limit in Air

Upper flammability limit	No data available
Lower flammability limit	No data available
Oxidizing properties	No data available.
Bulk density	Not applicable

10. STABILITY AND REACTIVITY

Reactivity
Not applicable.

Chemical stability
Stable under normal conditions.

Explosion data

Sensitivity to Mechanical Impact None.
Sensitivity to Static Discharge None.

Possibility of Hazardous Reactions

None under normal processing.

Hazardous polymerization

Hazardous polymerization does not occur.

Conditions to avoid

Excessive heat.

Incompatible materials

Strong acids. Strong bases. Strong oxidizing agents.

Hazardous Decomposition Products

Phosgene. Hydrogen chloride. Carbon monoxide.

11. TOXICOLOGICAL INFORMATION

Information on Likely Routes of Exposure

Product Information

Inhalation	May cause irritation of respiratory tract. Toxic by inhalation.
Eye contact	Irritating to eyes. Causes serious eye irritation.
Skin contact	Causes skin irritation.
Ingestion	Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. Harmful if swallowed.
Symptoms	Redness. May cause redness and tearing of the eyes. Coughing and/ or wheezing. Difficulty in breathing.

Acute toxicity

Harmful if swallowed
Toxic if inhaled

Product Acute Toxicity Data

If available, see ingredient data below.

Ingredient Acute Toxicity Data

Test data reported below.

Oral Exposure Route

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Chloroform (100%) CAS#: 67-66-3	Rat LD_{50}	695 mg/kg	None reported	None reported	GESTIS (Information System on Hazardous Substances of the German Social Accident Insurance)

Inhalation (Dust/Mist) Exposure Route

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data

Chloroform (100%) CAS#: 67-66-3	Rat LC_{50}	47.702 mg/L	4 hours	None reported	RTECS (Registry of Toxic Effects of Chemical Substances)

Inhalation (Vapor) Exposure Route

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Chloroform (100%) CAS#: 67-66-3	None reported	None reported	None reported	None reported	No information available

Unknown Acute Toxicity
0% of the mixture consists of ingredient(s) of unknown toxicity.

Acute Toxicity Estimations (ATE)
Not applicable
The following values are calculated based on chapter 3.1 of the GHS document

ATEmix (oral)	No information available
ATEmix (dermal)	No information available
ATEmix (inhalation-dust/mist)	No information available
ATEmix (inhalation-vapor)	No information available
ATEmix (inhalation-gas)	No information available

Skin corrosion/irritation
Classification based on data available for ingredients. Irritating to skin.

Product Skin Corrosion/Irritation Data
If available, see ingredient data below.

Ingredient Skin Corrosion/Irritation Data
Test data reported below.

Chemical name	Test method	Species	Reported dose	Exposure time	Results	Key literature references and sources for data
Chloroform (100%) CAS#: 67-66-3	Standard Draize Test	Rabbit	None reported	None reported	Skin irritant	ECHA (The European Chemicals Agency)

Serious eye damage/irritation
Classification based on data available for ingredients. Irritating to eyes.

Product Serious Eye Damage/Eye Irritation Data
If available, see ingredient data below.

Ingredient Eye Damage/Eye Irritation Data
Test data reported below.

Chemical name	Test method	Species	Reported dose	Exposure time	Results	Key literature references and sources for data
Chloroform (100%) CAS#: 67-66-3	Standard Draize Test	Rabbit	20 mg	24 hours	Eye irritant	RTECS (Registry of Toxic Effects of Chemical Substances)

Respiratory or skin sensitization
Based on available data, the classification criteria are not met.

Product Sensitization Data
If available, see ingredient data below.

Ingredient Sensitization Data
Test data reported below.

Skin Sensitization Exposure Route

Chemical name	Test method	Species	Results	Key literature references and sources for data
Chloroform (100%) CAS#: 67-66-3	OECD Test No. 406: Skin Sensitization	Guinea pig	Not confirmed to be a skin sensitizer	ECHA (The European Chemicals Agency)

STOT - single exposure
Based on available data, the classification criteria are not met.

Product Specific Target Organ Toxicity Single Exposure Data
If available, see ingredient data below.

Ingredient Specific Target Organ Toxicity Single Exposure Data
Test data reported below.

Oral Exposure Route

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Chloroform (100%) CAS#: 67-66-3	Man LD_{Lo}	2514 mg/kg	None reported	**Kidney, Ureter, or Bladder** Changes in tubules (including acute renal failure, acute tubular necrosis)	RTECS (Registry of Toxic Effects of Chemical Substances)

Inhalation (Vapor) Exposure Route

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Chloroform (100%) CAS#: 67-66-3	Human TC_{Lo}	171 mg/L	4 hours	**Behavioral** Hallucinations, Distorted perceptions	RTECS (Registry of Toxic Effects of Chemical Substances)

STOT - repeated exposure
Causes damage to organs through prolonged or repeated exposure.

Product Specific Target Organ Toxicity Repeat Dose Data
If available, see ingredient data below.

Ingredient Specific Target Organ Toxicity Repeat Exposure Data
Test data reported below.

Oral Exposure Route

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Chloroform (100%) CAS#: 67-66-3	Rat TD_{Lo}	540 mg/kg	3 days	**Biochemical** Intermediary metabolism (other proteins) **Kidney, Ureter, or Bladder** Changes in tubules (including acute renal failure, acute tubular necrosis)	RTECS (Registry of Toxic Effects of Chemical Substances)

Inhalation (Dust/Mist) Exposure Route

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Chloroform (100%) CAS#: 67-66-3	Rat TC_{Lo}	90 mg/L	90 days	**Kidney, Ureter, or Bladder** Changes in tubules (including acute renal failure, acute tubular necrosis) **Liver** Hepatitis (hepatocellular necrosis), diffuse **Nutritional and Gross Metabolic** Weight loss or decreased weight gain	RTECS (Registry of Toxic Effects of Chemical Substances)

Inhalation (Vapor) Exposure Route

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Chloroform (100%) CAS#: 67-66-3	Human TC_{Lo}	0.010 mg/L	365 days	**Gastrointestinal** Nausea or vomiting Other changes	RTECS (Registry of Toxic Effects of Chemical Substances)

Carcinogenicity

Classification based on data available for ingredients. Contains a known or suspected carcinogen.

Product Carcinogenicity Data
If available, see ingredient data below.

Ingredient Carcinogenicity Data
Test data reported below.

Chemical name	CAS No.	ACGIH	IARC	NTP	OSHA
Chloroform	67-66-3	A3	Group 2B	Reasonably Anticipated	X

Legend

ACGIH (American Conference of Governmental Industrial Hygienists)	A3 - Animal Carcinogen
IARC (International Agency for Research on Cancer)	Group 2B - Possibly Carcinogenic to Humans
NTP (National Toxicology Program)	Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen
OSHA (Occupational Safety and Health Administration of the US Department of Labor)	X - Present

Inhalation (Vapor) Exposure Route

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Chloroform (100%) CAS#: 67-66-3	Mouse NOAEL	5 mg/L	2 years	**Kidney, Ureter, or Bladder** Kidney tumors	ECHA (The European Chemicals Agency)

Germ cell mutagenicity

Based on available data, the classification criteria are not met.

Product Germ Cell Mutagenicity *invitro* Data
If available, see ingredient data below.

Ingredient Germ Cell Mutagenicity *invitro* **Data**
Test data reported below.

Chemical name	Test	Cell Strain	Reported dose	Exposure time	Results	Key literature references and sources for data
Chloroform (100%) CAS#: 67-66-3	Mutation in microorganisms	*Salmonella typhimurium*	5%	24 hours	Negative test result for mutagenicity	ECHA (The European Chemicals Agency)

Product Germ Cell Mutagenicity *invivo* **Data**
If available, see ingredient data below.

Ingredient Germ Cell Mutagenicity *invivo* **Data**
Test data reported below.

Oral Exposure Route

Chemical name	Test	Species	Reported dose	Exposure time	Results	Key literature references and sources for data
Chloroform (100%) CAS#: 67-66-3	Micronucleus test	Rat	480 mg/kg	5 days	Negative test result for mutagenicity	ECHA (The European Chemicals Agency)

<u>Reproductive toxicity</u>
Classification based on data available for ingredients. Contains a known or suspected reproductive toxin. The table below indicates ingredients above the cut-off threshold considered as relevant which are listed as reproductive toxins.

Product Reproductive Toxicity Data
No data available.

Ingredient Reproductive Toxicity Data
Test data reported below.

Oral Exposure Route

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Chloroform (100%) CAS#: 67-66-3	Mouse NOAEL	15.9 mg/kg	Multiple generations	**Effects on Fertility** Male fertility index (e.g. # males impregnating females per # males exposed to fertile nonpregnant females) Spermatogenesis (including genetic material, sperm morphology, motility, and count)	ECHA (The European Chemicals Agency)

Inhalation (Vapor) Exposure Route

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Chloroform (100%) CAS#: 67-66-3	Rat NOAEL	3 mg/L	9 days	**Effects on Embryo or Fetus** Fetotoxicity (except death e.g. stunted fetus)	ECHA (The European Chemicals Agency)

Aspiration hazard
Based on available data, the classification criteria are not met.

12. ECOLOGICAL INFORMATION

Ecotoxicity	Harmful to aquatic life with long lasting effects.
Unknown aquatic toxicity	0% of the mixture consists of components(s) of unknown hazards to the aquatic environment.

Product Ecological Data

Aquatic Acute Toxicity
If available, see ingredient data below.

Aquatic Chronic Toxicity
If available, see ingredient data below.

Ingredient Ecological Data

Aquatic Acute Toxicity
Test data reported below.

Fish

Chemical name	Exposure time	Species	Endpoint type	Reported dose	Key literature references and sources for data
Chloroform (100%) CAS#: 67-66-3	96 hours	*Oncorhynchus mykiss*	LC_{50}	18 mg/L	IUCLID (The International Uniform Chemical Information Database)

Crustacea

Chemical name	Exposure time	Species	Endpoint type	Reported dose	Key literature references and sources for data
Chloroform (100%) CAS#: 67-66-3	48 Hours	*Daphnia magna*	EC_{50}	29 mg/L	IUCLID (The International Uniform Chemical Information Database)

Algae

Chemical name	Exposure time	Species	Endpoint type	Reported dose	Key literature references and sources for data
Chloroform (100%) CAS#: 67-66-3	72 Hours	*Selenastrum capricornutum*	EC_{50}	13.3 mg/L	ECHA (The European Chemicals Agency)

Aquatic Chronic Toxicity
No data available.

Persistence and degradability

Product Biodegradability Data
No data available.

Bioaccumulation

Product Bioaccumulation Data
No data available.

Partition Coefficient (n-octanol/water) log K_{ow} = 1.97

Mobility

Soil Organic Carbon-Water Partition Coefficient	log K_{oc} = 1.71

Other adverse effects

Contains a substance with an endocrine-disrupting potential.

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations. Dispose of waste in accordance with environmental legislation.
Contaminated packaging	Do not reuse empty containers.
US EPA Waste Number	U044 D022

Chemical name	RCRA	RCRA - Basis for Listing	RCRA - D Series Wastes	RCRA - U Series Wastes
Chloroform 67-66-3	U044	Included in waste streams: F024, F025, F039, K009, K010, K019, K020, K021, K029, K073, K116, K149, K150, K151, K158	6.0 mg/L regulatory level	U044

Chemical name	RCRA - Halogenated Organic Compounds	RCRA - P Series Wastes	RCRA - F Series Wastes	RCRA - K Series Wastes
Chloroform 67-66-3	Category I - Volatiles	-	Toxic waste waste number F025 Waste description: Condensed light ends, spent filters and filter aids, and spent desiccant wastes from the production of certain chlorinated aliphatic hydrocarbons, by free radical catalyzed processes. These chlorinated aliphatic hydrocarbons are those having carbon chain lengths ranging from one to and including five, with varying amounts and positions of chlorine substitution.	Toxic waste waste number K021 Waste description: Aqueous spent antimony catalyst waste from fluoromethanes production.

Special instructions for disposal	Dispose of material in an E.P.A. approved hazardous waste facility.

14. TRANSPORT INFORMATION

DOT

UN/ID no	UN1888
Proper shipping name	Chloroform
Hazard Class	6.1
Packing Group	III
Reportable Quantity (RQ)	Chloroform: RQ kg= 4.54
Description	UN1888, Chloroform, 6.1, III, RQ
Emergency Response Guide Number	151

TDG

UN/ID no	UN1888

Proper shipping name	Chloroform
Hazard Class	6.1
Packing Group	III
Description	UN1888, Chloroform, 6.1, III

IATA

UN/ID no	UN1888
Proper shipping name	Chloroform
Hazard Class	6.1
Packing Group	III
ERG Code	6A

IMDG

UN/ID no	UN1888
Proper shipping name	Chloroform
Hazard Class	6.1
Packing Group	III
EmS-No	F-A, S-A

Additional information
There is a possibility that this product could be contained in a reagent set or kit composed of various compatible dangerous goods.
If the item is not in a reagent set or kit, the classification given above applies.
If the item is part of a reagent set or kit the classification would change to the following:
UN3316 Chemical Kit, Hazard Class 9, Packing Group II or III.
If the item is not regulated, the Chemical Kit classification does not apply.

15. REGULATORY INFORMATION

National Inventories

TSCA	Complies
DSL/NDSL	Complies

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

International Inventories

EINECS/ELINCS	Complies
ENCS	Complies
IECSC	Complies
KECL	Complies
PICCS	Complies
TCSI	Complies
AICS	Complies
NZIoC	Complies

EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances
ENCS - Japan Existing and New Chemical Substances
IECSC - China Inventory of Existing Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances
TCSI - Taiwan Chemical Substances Inventory
AICS - Australian Inventory of Chemical Substances
NZIoC - New Zealand Inventory of Chemicals

US Federal Regulations

SARA 313
Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product contains a chemical or chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

Chemical name	SARA 313 - Threshold Values %
Chloroform (CAS #: 67-66-3)	0.1

SARA 311/312 Hazard Categories

Acute health hazard	Yes
Chronic Health Hazard	Yes
Fire hazard	No
Sudden release of pressure hazard	No
Reactive Hazard	No

CWA (Clean Water Act)

This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

Chemical name	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants	CWA - Hazardous Substances
Chloroform 67-66-3	10 lb	X	X	X

CERCLA

This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material

Chemical name	Hazardous Substances RQs	CERCLA/SARA RQ	Reportable Quantity (RQ)
Chloroform 67-66-3	10 lb 1 lb	10 lb	RQ 10 lb final RQ RQ 4.54 kg final RQ RQ 1 lb final RQ RQ 0.454 kg final RQ

U.S. - Department of Homeland Security - Chemical Facility Anti-Terrorism Standards (CFATS) - Security Issues

Chemical name	U.S. - Department of Homeland Security - Chemical Facility Anti-Terrorism Standards (CFATS) - Security Issues
Chloroform (100%) CAS#: 67-66-3	Release - Toxic

US State Regulations

California Proposition 65

This product contains the following Proposition 65 chemicals

Chemical name	California Proposition 65
Chloroform (CAS #: 67-66-3)	Carcinogen Developmental

WARNING: This product can expose you to chemicals including Chloroform, which is known to the State of California to cause cancer and birth defects or other reproductive harm.
For more information, go to http://www.P65Warnings.ca.gov

IMERC: Not applicable

U.S. State Right-to-Know Regulations

This product may contain substances regulated by state right-to-know regulations.

Chemical name	New Jersey	Massachusetts	Pennsylvania
Chloroform 67-66-3	X	X	X

U.S. EPA Label Information

16. OTHER INFORMATION, INCLUDING DATE OF PREPARATION OF THE LAST REVISION

Special Comments

None

Additional information

Global Automotive Declarable Substance List (GADSL)

Chemical name	Global Automotive Declarable Substance List Classifications	Global Automotive Declarable Substance List Thersholds
Chloroform 67-66-3	Prohibited Substance (LR)	None reported

NFPA and HMIS Classifications

NFPA	**Health hazards** - 4	**Flammability** - 0	**Instability** - 0	**Physical and chemical properties** -
HMIS	**Health hazards** - 3 - *	**Flammability** - 0	**Physical hazards** - 0	**Personal protection** - X

Key or legend to abbreviations and acronyms used in the safety data sheet

NIOSH IDLH	*Immediately Dangerous to Life or Health*
ACGIH	ACGIH (American Conference of Governmental Industrial Hygienists)
NDF	*no data*

Legend - Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
MAC	Maximum Allowable Concentration	Ceiling	Ceiling Limit Value
X	Listed	Vacated	These values have no official status. The only binding levels of contaminants are those listed in the final OSHA PEL. These lists are for reference purposes only. Please note that some reference state regulations of these "liberated" exposure limits in their state regulations.
SKN*	Skin designation	SKN+	Skin sensitization
RSP+	Respiratory sensitization	**	Hazard Designation
C	Carcinogen	R	Reproductive toxicant
M	mutagen		

Prepared By	Hach Product Compliance Department
Issue Date	13-May-2019
Revision Date	13-May-2019
Revision Note	SDS sections updated 2

Disclaimer

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

THE INFORMATION CONTAINED HEREIN IS BASED ON DATA CONSIDERED TO BE ACCURATE. HOWEVER, NO WARRANTY IS EXPRESSED OR IMPLIED REGARDING THE ACCURACY OF THESE DATA OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF.

End of Safety Data Sheet

SAFETY DATA SHEET

Issue Date 06-Aug-2019 **Revision Date** 25-Nov-2019 **Version** 3.5 **Page** 1 / 11

1. IDENTIFICATION

Product identifier

Product Name	Demineralizer Bottle

Other means of identification

Product Code(s)	1429900 (U.S. Product Code 1429900)
Safety data sheet number	M00283

Recommended use of the chemical and restrictions on use

Recommended Use	Water Treatment Deionization.
Uses advised against	None.
Restrictions on use	None.

Details of the supplier of the safety data sheet

Manufacturer Address
Hach Company P.O.Box 389 Loveland, CO 80539 USA +1(970) 669-3050

Emergency telephone number
+1(303) 623-5716 - 24 Hour Service

2. HAZARDS IDENTIFICATION

Classification

Regulatory Status
This chemical is not considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Not a dangerous substance or mixture according to the Globally Harmonized System (GHS)

Hazards not otherwise classified (HNOC)
Not applicable

Label elements

Signal word
None

Hazard statements
The product contains no substances which at their given concentration, are considered to be hazardous to health

Other Hazards Known
None

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance
Not applicable

Mixture

4. FIRST AID MEASURES

Description of first aid measures

General advice	No hazards which require special first aid measures. Use first aid treatment according to the nature of the injury.
Inhalation	Remove to fresh air.
Eye contact	Rinse thoroughly with plenty of water for at least 15 minutes, lifting lower and upper eyelids. Consult a physician.
Skin contact	Wash skin with soap and water.
Ingestion	Clean mouth with water and drink afterwards plenty of water.

Most important symptoms and effects, both acute and delayed

Symptoms	See Section 11 for additional Toxicological Information.

Indication of any immediate medical attention and special treatment needed

Note to physicians	Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Unsuitable Extinguishing Media	Caution: Use of water spray when fighting fire may be inefficient.
Specific hazards arising from the chemical	No information available.
Hazardous combustion products	styrene. divinylbenzene. Carbon monoxide, Carbon dioxide.
Special protective equipment for fire-fighters	Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear. Use personal protection equipment.

6. ACCIDENTAL RELEASE MEASURES

U.S. Notice	Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance. Outside of the US, only persons properly qualified according to state or local regulations should respond to a spill involving chemicals.

Personal precautions, protective equipment and emergency procedures

Personal precautions	Ensure adequate ventilation.

Environmental precautions

Environmental precautions	See Section 12 for additional ecological information.

Methods and material for containment and cleaning up

Methods for containment	Prevent further leakage or spillage if safe to do so.
Methods for cleaning up	Pick up and transfer to properly labeled containers.
Prevention of secondary hazards	Clean contaminated objects and areas thoroughly observing environmental regulations.
Reference to other sections	See section 8 for more information. See section 13 for more information.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling	Handle in accordance with good industrial hygiene and safety practice.

Conditions for safe storage, including any incompatibilities

Storage Conditions	Keep containers tightly closed in a dry, cool and well-ventilated place.
Flammability class	Not applicable

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines	This product, as supplied, does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies

Appropriate engineering controls

Engineering Controls	Showers Eyewash stations Ventilation systems.

Individual protection measures, such as personal protective equipment

Respiratory protection	No protective equipment is needed under normal use conditions. If exposure limits are exceeded or irritation is experienced, ventilation and evacuation may be required.
Hand Protection	Wear suitable gloves.
Eye/face protection	Wear safety glasses with side shields (or goggles).
Skin and body protection	No special protective equipment required.
General Hygiene Considerations	Handle in accordance with good industrial hygiene and safety practice.
Environmental exposure controls	Local authorities should be advised if significant spillages cannot be contained. Do not allow into any sewer, on the ground or into any body of water.

Thermal hazards None under normal processing.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state Solid Liquid

Appearance	Beads aqueous solution	**Color**	Gold and dark blue
Odor	Amine	**Odor threshold**	No data available

Property	Values	Remarks • Method
Molecular weight	No data available	
pH	~ 7	
Melting point/freezing point	0 °C / 32 °F	
Boiling point / boiling range	~ 71 °C / 160 °F	
Evaporation rate	Not applicable	
Vapor pressure	Not applicable at 20 °C / 68 °F	
Vapor density (air = 1)	Not applicable	
Specific gravity (water = 1 / air = 1)	1.2	
Partition Coefficient (n-octanol/water)	Not applicable	
Soil Organic Carbon-Water Partition Coefficient	Not applicable	
Autoignition temperature	> 500 °C / 932 °F	
Decomposition temperature	No data available	
Dynamic viscosity	Not applicable	
Kinematic viscosity	Not applicable	

Solubility(ies)

Water solubility

Water solubility classification	Water solubility	Water Solubility Temperature
Insoluble	< 0.1 mg/L	25 °C / 77 °F

Solubility in other solvents

Chemical Name	Solubility classification	Solubility	Solubility Temperature
None reported	No information available	No data available	No information available

Other Information

Metal Corrosivity

Steel Corrosion Rate	Not applicable
Aluminum Corrosion Rate	Not applicable

Volatile Organic Compounds (VOC) Content

Not applicable

Explosive properties

Upper explosion limit	No data available
Lower explosion limit	No data available

Flammable properties

Flash point	Not applicable

Flammability Limit in Air

Upper flammability limit	No data available
Lower flammability limit	No data available

Oxidizing properties	No data available.
Bulk density	No data available

10. STABILITY AND REACTIVITY

Reactivity
Not applicable.

Chemical stability
Stable under normal conditions.

Explosion data

Sensitivity to Mechanical Impact	None.
Sensitivity to Static Discharge	None.

Possibility of Hazardous Reactions
None under normal processing.

Hazardous polymerization
None under normal processing.

Conditions to avoid
None known based on information supplied.

Incompatible materials
Strong oxidizing agents, strong acids, and strong bases.

Hazardous Decomposition Products
divinylbenzene. styrene. Carbon monoxide. Carbon dioxide.

11. TOXICOLOGICAL INFORMATION

Information on Likely Routes of Exposure

Product Information

Inhalation	No known effect based on information supplied.
Eye contact	No known effect based on information supplied.
Skin contact	No known effect based on information supplied.

Ingestion No known effect based on information supplied.

Symptoms No information available.

Acute toxicity
Based on available data, the classification criteria are not met

Product Acute Toxicity Data
No data available.

Ingredient Acute Toxicity Data
No data available.

Unknown Acute Toxicity
0% of the mixture consists of ingredient(s) of unknown toxicity.

Acute Toxicity Estimations (ATE)

ATEmix (oral)	No information available
ATEmix (dermal)	No information available
ATEmix (inhalation-dust/mist)	No information available
ATEmix (inhalation-vapor)	No information available
ATEmix (inhalation-gas)	No information available

Skin corrosion/irritation
Based on available data, the classification criteria are not met.

Product Skin Corrosion/Irritation Data
No data available.

Ingredient Skin Corrosion/Irritation Data
No data available.

Serious eye damage/irritation
Based on available data, the classification criteria are not met.

Product Serious Eye Damage/Eye Irritation Data
No data available.

Ingredient Eye Damage/Eye Irritation Data
No data available.

Respiratory or skin sensitization
Based on available data, the classification criteria are not met.

Product Sensitization Data
No data available.

Ingredient Sensitization Data
No data available.

STOT - single exposure
Based on available data, the classification criteria are not met.

Product Specific Target Organ Toxicity Single Exposure Data
No data available.

Ingredient Specific Target Organ Toxicity Single Exposure Data
No data available.

STOT - repeated exposure
Based on available data, the classification criteria are not met.

Product Specific Target Organ Toxicity Repeat Dose Data
No data available.

Ingredient Specific Target Organ Toxicity Repeat Exposure Data
No data available.

Carcinogenicity
Based on available data, the classification criteria are not met.

Product Carcinogenicity Data
No data available.

Ingredient Carcinogenicity Data
No data available.

Legend

ACGIH (American Conference of Governmental Industrial Hygienists)	Does not apply
IARC (International Agency for Research on Cancer)	Does not apply
NTP (National Toxicology Program)	Does not apply
OSHA (Occupational Safety and Health Administration of the US Department of Labor)	Does not apply

Germ cell mutagenicity
Based on available data, the classification criteria are not met.

Product Germ Cell Mutagenicity *invitro* **Data**
No data available.

Ingredient Germ Cell Mutagenicity *invitro* **Data**
No data available.

Product Germ Cell Mutagenicity *invivo* **Data**
No data available.

Ingredient Germ Cell Mutagenicity *invivo* **Data**
No data available.

Reproductive toxicity
Based on available data, the classification criteria are not met.

Product Reproductive Toxicity Data
No data available.

Ingredient Reproductive Toxicity Data
No data available.

Aspiration hazard
Based on available data, the classification criteria are not met.

12. ECOLOGICAL INFORMATION

Ecotoxicity	Based on available data, the classification criteria are not met.
Unknown aquatic toxicity	0% of the mixture consists of components(s) of unknown hazards to the aquatic

environment.

Product Ecological Data

Aquatic Acute Toxicity
No data available.

Aquatic Chronic Toxicity
No data available.

Ingredient Ecological Data

Aquatic Acute Toxicity
No data available.

Aquatic Chronic Toxicity
No data available.

Persistence and degradability

Product Biodegradability Data
No data available.

Bioaccumulation

Product Bioaccumulation Data
No data available.

Partition Coefficient (n-octanol/water)	Not applicable

Mobility

Soil Organic Carbon-Water Partition Coefficient	Not applicable

Other adverse effects
No information available.

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations. Dispose of waste in accordance with environmental legislation.
Contaminated packaging	Do not reuse empty containers.
Special instructions for disposal	If permitted by regulation. Place material in a plastic bag. Mark bag 'Non-hazardous trash', and dispose of as normal refuse. Check with local municipal and state authorities and waste contractors for pertinent local information regarding the proper disposal of chemicals.

14. TRANSPORT INFORMATION

DOT	Not regulated
TDG	Not regulated
IATA	Not regulated

IMDG	Not regulated

Additional information

There is a possibility that this product could be contained in a reagent set or kit composed of various compatible dangerous goods.
If the item is not in a reagent set or kit, the classification given above applies.
If the item is part of a reagent set or kit the classification would change to the following:
UN3316 Chemical Kit, Hazard Class 9, Packing Group II or III.
If the item is not regulated, the Chemical Kit classification does not apply.

15. REGULATORY INFORMATION

National Inventories

TSCA	Complies
DSL/NDSL	Complies

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

International Inventories

EINECS/ELINCS	Does not comply
ENCS	Does not comply
IECSC	Complies
KECL	Complies
PICCS	Complies
TCSI	Complies
AICS	Complies
NZIoC	Does not comply

EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances
ENCS - Japan Existing and New Chemical Substances
IECSC - China Inventory of Existing Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances
TCSI - Taiwan Chemical Substances Inventory
AICS - Australian Inventory of Chemical Substances
NZIoC - New Zealand Inventory of Chemicals

US Federal Regulations

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

SARA 311/312 Hazard Categories

Acute health hazard	Yes
Chronic Health Hazard	No
Fire hazard	No
Sudden release of pressure hazard	No
Reactive Hazard	No

CWA (Clean Water Act)

This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

CERCLA

This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material

US State Regulations

California Proposition 65

This product does not contain any Proposition 65 chemicals

U.S. State Right-to-Know Regulations

This product does not contain any substances regulated by state right-to-know regulations.

U.S. EPA Label Information

16. OTHER INFORMATION, INCLUDING DATE OF PREPARATION OF THE LAST REVISION

Special Comments

None

Additional information

Global Automotive Declarable Substance List (GADSL)
Not applicable

NFPA and HMIS Classifications

NFPA	**Health hazards** - 0	**Flammability** - 1	**Instability** - 0	**Physical and chemical properties** -
HMIS	**Health hazards** - 0	**Flammability** - 1	**Physical hazards** - 0	**Personal protection** - X

Key or legend to abbreviations and acronyms used in the safety data sheet

NIOSH IDLH	*Immediately Dangerous to Life or Health*
ACGIH	ACGIH (American Conference of Governmental Industrial Hygienists)
NDF	*no data*

Legend - Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
MAC	Maximum Allowable Concentration	Ceiling	Ceiling Limit Value
X	Listed	Vacated	These values have no official status. The only binding levels of contaminants are those listed in the final OSHA PEL. These lists are for reference purposes only. Please note that some reference state regulations of these "liberated" exposure limits in their state regulations.
SKN*	Skin designation	SKN+	Skin sensitization
RSP+	Respiratory sensitization	**	Hazard Designation
C	Carcinogen	R	Reproductive toxicant
M	mutagen		

Prepared By	Hach Product Compliance Department
Issue Date	06-Aug-2019
Revision Date	25-Nov-2019

Revision Note None

Disclaimer

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

End of Safety Data Sheet

SAFETY DATA SHEET

Issue Date 16-Aug-2018 **Revision Date** 16-Aug-2018 **Version** 2.2 **Page** 1 / 17

1. IDENTIFICATION

Product identifier

Product Name	Detergents Reagent

Other means of identification

Product Code(s)	105932
Safety data sheet number	M00831

Recommended use of the chemical and restrictions on use

Recommended Use	Determination of detergents.
Uses advised against	None.
Restrictions on use	None.

Details of the supplier of the safety data sheet

Manufacturer Address
Hach Company P.O.Box 389 Loveland, CO 80539 USA +1(970) 669-3050

Emergency telephone number
+1(303) 623-5716 - 24 Hour Service +1(515)232-2533 - 8am - 4pm CST

2. HAZARDS IDENTIFICATION

Classification

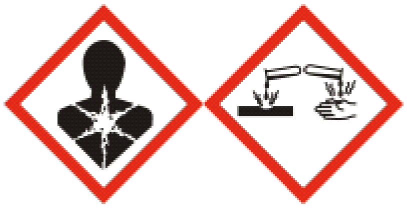
Regulatory Status
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 1
Carcinogenicity	Category 2
Reproductive toxicity	Category 2
Chronic aquatic toxicity	Category 3

Hazards not otherwise classified (HNOC)
Not applicable

Label elements

Signal word - Danger



Hazard statements

H315 - Causes skin irritation
H318 - Causes serious eye damage
H351 - Suspected of causing cancer
H361 - Suspected of damaging fertility or the unborn child
H412 - Harmful to aquatic life with long lasting effects

Precautionary statements
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P332 + P313 - If skin irritation occurs: Get medical advice/attention
P362 - Take off contaminated clothing and wash before reuse
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
P201 - Obtain special instructions before use
P308 + P313 - IF exposed or concerned: Get medical advice/attention
P405 - Store locked up
P501 - Dispose of contents/ container to an approved waste disposal plant
P273 - Avoid release to the environment

Other Hazards Known
Harmful to aquatic life

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance
Not applicable

Mixture

Chemical Family	Mixture.

Percent ranges are used where confidential product information is applicable.

Chemical name	CAS No.	Percent Range	HMRIC #
Sulfuric acid	7664-93-9	1 - 5%	-
Chloroform	67-66-3	<1%	-
Sodium arsenite	7784-46-5	<0.1%	-

4. FIRST AID MEASURES

Description of first aid measures

General advice	Show this safety data sheet to the doctor in attendance. IF exposed or concerned: Get medical advice/attention.
Inhalation	Remove to fresh air. Get medical attention immediately if symptoms occur.
Eye contact	Get immediate medical advice/attention. Rinse immediately with plenty of water, also under

the eyelids, for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Keep eye wide open while rinsing. Do not rub affected area.

Skin contact	Wash off immediately with soap and plenty of water for at least 15 minutes. Get medical attention if irritation develops and persists.
Ingestion	Clean mouth with water and drink afterwards plenty of water. Never give anything by mouth to an unconscious person. Do NOT induce vomiting. Call a physician.
Self-protection of the first aider	Avoid contact with skin, eyes or clothing.

Most important symptoms and effects, both acute and delayed

Symptoms	Burning sensation.

Indication of any immediate medical attention and special treatment needed

Note to physicians	Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Unsuitable Extinguishing Media	Caution: Use of water spray when fighting fire may be inefficient.
Specific hazards arising from the chemical	No information available.
Hazardous combustion products	This material will not burn.
Special protective equipment for fire-fighters	Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear.

6. ACCIDENTAL RELEASE MEASURES

U.S. Notice	Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance. Outside of the US, only persons properly qualified according to state or local regulations should respond to a spill involving chemicals.

Personal precautions, protective equipment and emergency procedures

Personal precautions	Avoid contact with skin, eyes or clothing. Use personal protective equipment as required. Ensure adequate ventilation.
Other Information	Refer to protective measures listed in Sections 7 and 8.

Environmental precautions

Environmental precautions	Prevent further leakage or spillage if safe to do so.

Methods and material for containment and cleaning up

Methods for containment	Prevent further leakage or spillage if safe to do so.
Methods for cleaning up	Pick up and transfer to properly labeled containers.

Prevention of secondary hazards Clean contaminated objects and areas thoroughly observing environmental regulations.

Reference to other sections See section 8 for more information. See section 13 for more information.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes or clothing. Do not eat, drink or smoke when using this product. Remove contaminated clothing and shoes. Take off contaminated clothing and wash before reuse.

Conditions for safe storage, including any incompatibilities

Storage Conditions Keep containers tightly closed in a dry, cool and well-ventilated place. Store locked up. Keep out of the reach of children.

Flammability class Not applicable

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines

Chemical name	ACGIH TLV	OSHA PEL	NIOSH IDLH
Sulfuric acid CAS#: 7664-93-9	TWA: 0.2 mg/m^3	TWA: 1 mg/m^3 (vacated) TWA: 1 mg/m^3	IDLH: 15 mg/m^3 TWA: 1 mg/m^3
Chloroform CAS#: 67-66-3	TWA: 10 ppm	(vacated) TWA: 2 ppm (vacated) TWA: 9.78 mg/m^3 Ceiling: 50 ppm Ceiling: 240 mg/m^3	IDLH: 500 ppm STEL: 2 ppm 60 min STEL: 9.78 mg/m^3 60 min
Sodium arsenite CAS#: 7784-46-5	TWA: 0.01 mg/m^3	TWA: 10 µg/m^3	IDLH: 5 mg/m^3 As Ceiling: 0.002 mg/m^3 As 15 min

Appropriate engineering controls

Engineering Controls Showers
Eyewash stations
Ventilation systems.

Individual protection measures, such as personal protective equipment

Respiratory protection No protective equipment is needed under normal use conditions. If exposure limits are exceeded or irritation is experienced, ventilation and evacuation may be required.

Hand Protection Wear suitable gloves. Impervious gloves.

Eye/face protection Tight sealing safety goggles.

Skin and body protection Wear suitable protective clothing. Long sleeved clothing.

General Hygiene Considerations Avoid contact with skin, eyes or clothing. Wear suitable gloves and eye/face protection. Do not eat, drink or smoke when using this product. Wash hands before breaks and immediately after handling the product.

Environmental exposure controls	Local authorities should be advised if significant spillages cannot be contained. Do not allow into any sewer, on the ground or into any body of water.
Thermal hazards	None under normal processing.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state Liquid

Appearance	aqueous solution	**Color**	blue
Odor	Not determined	**Odor threshold**	No data available

Property	Values	Remarks • Method
Molecular weight	No data available	
pH	1.2	
Melting point/freezing point	~ -38 °C / -36 °F	Estimation based on theoretical calculation
Boiling point / boiling range	~ 110 °C / 230 °F	Estimation based on theoretical calculation
Evaporation rate	0.52 (water = 1)	
Vapor pressure	22.727 mm Hg / 3.03 kPa at 25 °C / 77 °F	Estimation based on theoretical calculation
Vapor density (air = 1)	0.63 (air = 1)	
Specific gravity (water = 1 / air = 1)	1.142	
Partition Coefficient (n-octanol/water)	Not applicable	
Soil Organic Carbon-Water Partition Coefficient	Not applicable	
Autoignition temperature	No data available	
Decomposition temperature	No data available	
Dynamic viscosity	No data available	
Kinematic viscosity	No data available	

Solubility(ies)

Water solubility

Water solubility classification	Water solubility	Water Solubility Temperature
Soluble	> 1000 mg/L	25 °C / 77 °F

Solubility in other solvents

Chemical Name	Solubility classification	Solubility	Solubility Temperature
Acid	Soluble	> 1000 mg/L	25 °C / 77 °F
Ethyl alcohol	Soluble	> 1000 mg/L	25 °C / 77 °F

Other Information

Metal Corrosivity

Steel Corrosion Rate No data available
Aluminum Corrosion Rate No data available

Volatile Organic Compounds (VOC) Content
See ingredients information below

Chemical name	CAS No.	Volatile organic compounds (VOC) content	CAA (Clean Air Act)
Sulfuric acid	7664-93-9	No data available	-
Chloroform	67-66-3	100%	X
Sodium arsenite	7784-46-5	No data available	-

Explosive properties

Upper explosion limit No data available
Lower explosion limit No data available

Flammable properties

Flash point No data available

Flammability Limit in Air
Upper flammability limit No data available
Lower flammability limit No data available

Oxidizing properties No data available.

Bulk density No data available

Particle Size No information available

Particle Size Distribution No information available

10. STABILITY AND REACTIVITY

Reactivity
Not applicable.

Chemical stability
Stability Stable under normal conditions.

Explosion data
Sensitivity to Mechanical Impact None
Sensitivity to Static Discharge None.

Possibility of Hazardous Reactions
Possibility of Hazardous Reactions None under normal processing.

Hazardous polymerization
None under normal processing.

Conditions to avoid
Conditions to avoid None known based on information supplied.

Incompatible materials
Incompatible materials Strong acids. Strong bases. Strong oxidizing agents.

Hazardous Decomposition Products
Thermal decomposition can lead to release of irritating and toxic gases and vapors.

11. TOXICOLOGICAL INFORMATION

Information on Likely Routes of Exposure
Product Information

Inhalation	May cause irritation of respiratory tract.
Eye contact	Severely irritating to eyes. Causes serious eye damage. May cause burns. May cause irreversible damage to eyes.
Skin contact	Causes skin irritation.
Ingestion	Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.
Symptoms	Redness. Burning. May cause blindness. May cause redness and tearing of the eyes.
Aggravated Medical Conditions	Eye disorders. Skin disorders. Respiratory disorders. Preexisting eye disorders. Teeth.
Toxicologically synergistic products	None known.
Toxicokinetics, metabolism and distribution	See ingredients information below.

Chemical name	Toxicokinetics, metabolism and distribution
Sulfuric acid (1 - 5%) CAS#: 7664-93-9	The corrosivity of sulfuric acid makes it difficult to assess its effects on metabolism. Its corrosivity is also the main contributor to acute deaths, therefore it is not classified for acute toxicity.
Chloroform (<1%) CAS#: 67-66-3	A specific liver enzyme converts chloroform into toxic metabolites resulting in hepatotoxicity.

Product Acute Toxicity Data

Oral Exposure Route	No data available
Dermal Exposure Route	No data available
Inhalation (Dust/Mist) Exposure Route	No data available
Inhalation (Vapor) Exposure Route	No data available
Inhalation (Gas) Exposure Route	No data available

Unknown Acute Toxicity
0% of the mixture consists of ingredient(s) of unknown toxicity.

Acute Toxicity Estimations (ATE)

The following values are calculated based on chapter 3.1 of the GHS document

ATEmix (oral)	No information available
ATEmix (dermal)	No information available
ATEmix (inhalation-dust/mist)	100.20 mg/L
ATEmix (inhalation-vapor)	600.00 mg/L
ATEmix (inhalation-gas)	No information available

Ingredient Acute Toxicity Data
Oral Exposure Route If available, see data below

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data

Sodium arsenite (<0.1%) CAS#: 7784-46-5	Rat LD_{50}	41 mg/kg	None reported	None reported	RTECS (Registry of Toxic Effects of Chemical Substances)

Dermal Exposure Route If available, see data below

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Chloroform (<1%) CAS#: 67-66-3	Rabbit LD_{50}	> 20000 mg/kg	None reported	None reported	RTECS (Registry of Toxic Effects of Chemical Substances)
Sodium arsenite (<0.1%) CAS#: 7784-46-5	Rat LD_{50}	150 mg/kg	None reported	None reported	RTECS (Registry of Toxic Effects of Chemical Substances)

Inhalation (Dust/Mist) Exposure Route If available, see data below

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Chloroform (<1%) CAS#: 67-66-3	Rat LC_{50}	4.7702 mg/L	4 hours	None reported	RTECS (Registry of Toxic Effects of Chemical Substances)

Inhalation (Vapor) Exposure Route If available, see data below
Inhalation (Gas) Exposure Route If available, see data below

Product Specific Target Organ Toxicity Single Exposure Data

Oral Exposure Route No data available
Dermal Exposure Route No data available
Inhalation (Dust/Mist) Exposure Route No data available
Inhalation (Vapor) Exposure Route No data available
Inhalation (Gas) Exposure Route No data available

Ingredient Specific Target Organ Toxicity Single Exposure Data

Oral Exposure Route If available, see data below

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Chloroform (<1%) CAS#: 67-66-3	Man LD_{Lo}	2514 mg/kg	None reported	**Kidney, Ureter, or Bladder** Changes in tubules (including acute renal failure, acute tubular necrosis)	RTECS (Registry of Toxic Effects of Chemical Substances)

Dermal Exposure Route If available, see data below
Inhalation (Dust/Mist) Exposure Route If available, see data below
Inhalation (Vapor) Exposure Route If available, see data below

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Sulfuric acid (1 - 5%) CAS#: 7664-93-9	Human TD_{Lo}	0.144 mg/L	5 minutes	**Lungs, Thorax, or Respiration** Dyspnea	RTECS (Registry of Toxic Effects of Chemical Substances)
Chloroform (<1%) CAS#: 67-66-3	Human TC_{Lo}	171 mg/L	4 hours	**Behavioral** Hallucinations, Distorted perceptions	RTECS (Registry of Toxic Effects of Chemical Substances)

Inhalation (Gas) Exposure Route If available, see data below

Aspiration toxicity

No data available

Product Skin Corrosion/Irritation Data

Test data reported below.

Test method	Species	Reported dose	Exposure time	Results
United States Department of Transportation (DOT) Skin Corrosion Test	Rabbit	0.5 mL	4 hours	Not corrosive to skin

Ingredient Skin Corrosion/Irritation Data

If available, see data below

Chemical name	Test method	Species	Reported dose	Exposure time	Results	Key literature references and sources for data
Sulfuric acid (1 - 5%) CAS#: 7664-93-9	Existing human experience	Human	None reported	None reported	Corrosive to skin	HSDB (Hazardous Substances Data Bank)
Chloroform (<1%) CAS#: 67-66-3	Open Irritation Test	Rabbit	10 mg	24 hours	Mild skin irritant	RTECS (Registry of Toxic Effects of Chemical Substances)
Sodium arsenite (<0.1%) CAS#: 7784-46-5	Existing human experience	Human	None reported	None reported	Skin irritant	No information available

Product Serious Eye Damage/Eye Irritation Data

No data available.

Ingredient Eye Damage/Eye Irritation Data

If available, see data below

Chemical name	Test method	Species	Reported dose	Exposure time	Results	Key literature references and sources for data
Sulfuric acid (1 - 5%) CAS#: 7664-93-9	Existing human experience	Human	None reported	None reported	Corrosive to eyes	HSDB (Hazardous Substances Data Bank)
Chloroform (<1%) CAS#: 67-66-3	Standard Draize Test	Rabbit	20 mg	24 hours	Eye irritant	RTECS (Registry of Toxic Effects of Chemical Substances)
Sodium arsenite (<0.1%) CAS#: 7784-46-5	Existing human experience	Human	None reported	None reported	Eye irritant	No information available

Sensitization Information

Product Sensitization Data

Skin Sensitization Exposure Route	No data available.
Respiratory Sensitization Exposure Route	No data available.

Ingredient Sensitization Data

Skin Sensitization Exposure Route	If available, see data below.
Respiratory Sensitization Exposure Route	If available, see data below.

Chronic Toxicity Information

Product Specific Target Organ Toxicity Repeat Dose Data

Oral Exposure Route	No data available.
Dermal Exposure Route	No data available.
Inhalation (Dust/Mist) Exposure Route	No data available.
Inhalation (Vapor) Exposure Route	No data available.
Inhalation (Gas) Exposure Route	No data available.

Ingredient Specific Target Organ Toxicity Repeat Exposure Data

Oral Exposure Route If available, see data below

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Chloroform (<1%) CAS#: 67-66-3	Rat TD_{Lo}	540 mg/kg	3 days	**Biochemical** Intermediary metabolism (other proteins) **Kidney, Ureter, or Bladder**	RTECS (Registry of Toxic Effects of Chemical Substances)

				Changes in tubules (including acute renal failure, acute tubular necrosis)	

Dermal Exposure Route If available, see data below
Inhalation (Dust/Mist) Exposure Route If available, see data below

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Chloroform (<1%) CAS#: 67-66-3	Rat TC_{Lo}	90 mg/L	90 days	**Kidney, Ureter, or Bladder** Changes in tubules (including acute renal failure, acute tubular necrosis) **Liver** Hepatitis (hepatocellular necrosis), diffuse **Nutritional and Gross Metabolic** Weight loss or decreased weight gain	RTECS (Registry of Toxic Effects of Chemical Substances)

Inhalation (Vapor) Exposure Route If available, see data below

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Sulfuric acid (1 - 5%) CAS#: 7664-93-9	Human TC_{Lo}	.003 mg/L	168 days	**Musculoskeletal** Changes in teeth and supporting structures	RTECS (Registry of Toxic Effects of Chemical Substances)
Chloroform (<1%) CAS#: 67-66-3	Human TC_{Lo}	0.010 mg/L	365 days	**Gastrointestinal** Nausea or vomiting Other changes	RTECS (Registry of Toxic Effects of Chemical Substances)

Inhalation (Gas) Exposure Route If available, see data below

Product Carcinogenicity Data

Oral Exposure Route	No data available
Dermal Exposure Route	No data available
Inhalation (Dust/Mist) Exposure Route	No data available
Inhalation (Vapor) Exposure Route	No data available
Inhalation (Gas) Exposure Route	No data available

Ingredient Carcinogenicity Data

Chemical name	CAS No.	ACGIH	IARC	NTP	OSHA
Sulfuric acid	7664-93-9	A2	Group 1	Known	X
Chloroform	67-66-3	A3	Group 2B	Reasonably Anticipated	X
Sodium arsenite	7784-46-5	A1	Group 1	Known	X

Legend

ACGIH (American Conference of Governmental Industrial Hygienists)	A2 - Suspected Human Carcinogen A3 - Animal Carcinogen
IARC (International Agency for Research on Cancer)	Group 1 - Carcinogenic to Humans Group 2B - Possibly Carcinogenic to Humans
NTP (National Toxicology Program)	Known - Known Carcinogen Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen
OSHA (Occupational Safety and Health Administration of the US Department of Labor)	X - Present

Oral Exposure Route	If available, see data below
Dermal Exposure Route	If available, see data below
Inhalation (Dust/Mist) Exposure Route	If available, see data below
Inhalation (Vapor) Exposure Route	If available, see data below

Inhalation (Gas) Exposure Route If available, see data below

Product Germ Cell Mutagenicity *invitro* **Data**
No data available.

Ingredient Germ Cell Mutagenicity *invitro* **Data**
If available, see data below

Chemical name	Test	Cell Strain	Reported dose	Exposure time	Results	Key literature references and sources for data
Sulfuric acid (1 - 5%) CAS#: 7664-93-9	Cytogenetic analysis	Hamster ovary	4 mmol/L	None reported	Positive test result for mutagenicity	No information available
Sodium arsenite (<0.1%) CAS#: 7784-46-5	DNA damage	Human liver	0.001 mmol/L	None reported	Positive test result for mutagenicity	RTECS (Registry of Toxic Effects of Chemical Substances)

Chemical name	Test	Cell Strain	Reported dose	Exposure time	Results	Key literature references and sources for data
Sodium arsenite (<0.1%) CAS#: 7784-46-5	DNA damage	Human lung	0.001 mmol/L	None reported	Positive test result for mutagenicity	RTECS (Registry of Toxic Effects of Chemical Substances)

Product Germ Cell Mutagenicity *invivo* **Data**

Oral Exposure Route	No data available
Dermal Exposure Route	No data available
Inhalation (Dust/Mist) Exposure Route	No data available
Inhalation (Vapor) Exposure Route	No data available
Inhalation (Gas) Exposure Route	No data available

Ingredient Germ Cell Mutagenicity *invivo* **Data**
Oral Exposure Route If available, see data below

Chemical name	Test	Species	Reported dose	Exposure time	Results	Key literature references and sources for data
Sodium arsenite (<0.1%) CAS#: 7784-46-5	Specific locus test	Mouse	140 mg/kg	10 weeks	Positive test result for mutagenicity	RTECS (Registry of Toxic Effects of Chemical Substances)

Chemical name	Test	Species	Reported dose	Exposure time	Results	Key literature references and sources for data
Sodium arsenite (<0.1%) CAS#: 7784-46-5	DNA damage	Mouse	100 mg/kg	None reported	Positive test result for mutagenicity	RTECS (Registry of Toxic Effects of Chemical Substances)

Dermal Exposure Route	If available, see data below
Inhalation (Dust/Mist) Exposure Route	If available, see data below
Inhalation (Vapor) Exposure Route	If available, see data below
Inhalation (Gas) Exposure Route	If available, see data below

Product Reproductive Toxicity Data

Oral Exposure Route	No data available
Dermal Exposure Route	No data available
Inhalation (Dust/Mist) Exposure Route	No data available
Inhalation (Vapor) Exposure Route	No data available
Inhalation (Gas) Exposure Route	No data available

Ingredient Reproductive Toxicity Data

Oral Exposure Route If available, see data below

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Sodium arsenite (<0.1%) CAS#: 7784-46-5	Rat TD_{Lo}	0.05478 mg/kg	None reported	**Effects on Embryo or Fetus** Abortion **Effects on Newborn** Stillbirth	RTECS (Registry of Toxic Effects of Chemical Substances)
Chemical name	**Endpoint type**	**Reported dose**	**Exposure time**	**Toxicological effects**	**Key literature references and sources for data**
Sodium arsenite (<0.1%) CAS#: 7784-46-5	Rat TD_{Lo}	41 mg/kg	None reported	**Effects on Embryo or Fetus** Fetal death Fetotoxicity (except death e.g. stunted fetus)	RTECS (Registry of Toxic Effects of Chemical Substances)

Dermal Exposure Route If available, see data below

Inhalation (Dust/Mist) Exposure Route If available, see data below

Inhalation (Vapor) Exposure Route If available, see data below

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Sulfuric acid (1 - 5%) CAS#: 7664-93-9	Rabbit TC_{Lo}	.02 mg/L	7 hours	**Specific Developmental Abnormalities** Musculoskeletal system	No information available

Inhalation (Gas) Exposure Route If available, see data below

12. ECOLOGICAL INFORMATION

Ecotoxicity Harmful to aquatic life with long lasting effects

Product Ecological Data

Aquatic toxicity

Fish	No data available
Crustacea	No data available
Algae	No data available

Ingredient Ecological Data

Aquatic toxicity

Fish If available, see ingredient data below

Chemical name	Exposure time	Species	Endpoint type	Reported dose	Key literature references and sources for data
Chloroform (<1%) CAS#: 67-66-3	96 hours	*Oncorhynchus mykiss*	LC_{50}	18 mg/L	IUCLID (The International Uniform Chemical Information Database)
Sodium arsenite (<0.1%) CAS#: 7784-46-5	96 hours	*Esox masquinongy*	LC_{50}	0.55 mg/L	GESTIS (Information System on Hazardous Substances of the German Social Accident Insurance)

Crustacea If available, see ingredient data below

Chemical name	Exposure time	Species	Endpoint type	Reported dose	Key literature references and sources for data
Chloroform (<1%) CAS#: 67-66-3	48 Hours	*Daphnia magna*	EC_{50}	29 mg/L	IUCLID (The International Uniform Chemical Information Database)
Sodium arsenite (<0.1%) CAS#: 7784-46-5	48 Hours	None reported	EC_{50}	1.27 mg/L	GESTIS (Information System on Hazardous Substances of the German Social Accident Insurance)

Algae If available, see ingredient data below

Chemical name	Exposure time	Species	Endpoint type	Reported dose	Key literature references and sources for data
Sodium arsenite (<0.1%) CAS#: 7784-46-5	96 hours	None reported	EC_{50}	0.07 mg/L	GESTIS (Information System on Hazardous Substances of the German Social Accident Insurance)

Other Information

Persistence and degradability

Product Biodegradability Data
No data available.

Ingredient Biodegradability Data

Bioaccumulation

Product Bioaccumulation Data
No data available.

Partition Coefficient (n-octanol/water) Not applicable

Ingredient Bioaccumulation Data

Mobility

Soil Organic Carbon-Water Partition Coefficient Not applicable

Water solubility

Water solubility classification	Water solubility	Water Solubility Temperature
Soluble	> 1000 mg/L	25 °C / 77 °F

Other adverse effects
Contains a substance with an endocrine-disrupting potential.

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations. Dispose of waste in accordance with environmental legislation.

Contaminated packaging Do not reuse empty containers.

US EPA Waste Number D002, U044 D022

Chemical name	RCRA	RCRA - Basis for Listing	RCRA - D Series Wastes	RCRA - U Series Wastes
Chloroform 67-66-3	U044	Included in waste streams: F024, F025, F039, K009, K010, K019, K020, K021, K029, K073, K116, K149, K150, K151,	6.0 mg/L regulatory level	U044

		K158		

Chemical name	RCRA - Halogenated Organic Compounds	RCRA - P Series Wastes	RCRA - F Series Wastes	RCRA - K Series Wastes
Chloroform 67-66-3	Category I - Volatiles	-	Toxic waste waste number F025 Waste description: Condensed light ends, spent filters and filter aids, and spent desiccant wastes from the production of certain chlorinated aliphatic hydrocarbons, by free radical catalyzed processes. These chlorinated aliphatic hydrocarbons are those having carbon chain lengths ranging from one to and including five, with varying amounts and positions of chlorine substitution.	Toxic waste waste number K021 Waste description: Aqueous spent antimony catalyst waste from fluoromethanes production.

Special instructions for disposal	Dispose of material in an E.P.A. approved hazardous waste facility.

14. TRANSPORT INFORMATION

U.S. DOT	Not regulated
Emergency Response Guide Number	154
TDG	Not regulated
IATA	Not regulated
ERG Code	154
IMDG	Not regulated
Note:	No special precautions necessary.

Additional information
There is a possibility that this product could be contained in a reagent set or kit composed of various compatible dangerous goods.
If the item is not in a reagent set or kit, the classification given above applies.
If the item is part of a reagent set or kit the classification would change to the following:
UN3316 Chemical Kit, Hazard Class 9, Packing Group II or III.
If the item is not regulated, the Chemical Kit classification does not apply.

15. REGULATORY INFORMATION

National Inventories

TSCA	Complies
DSL/NDSL	Complies

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

International Inventories

EINECS/ELINCS	Complies
ENCS	Does not comply
IECSC	Complies
KECL	Complies
PICCS	Complies
TCSI	Complies
AICS	Complies

NZIoC	Complies

EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances
ENCS - Japan Existing and New Chemical Substances
IECSC - China Inventory of Existing Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances
TCSI - Taiwan Chemical Substances Inventory
AICS - Australian Inventory of Chemical Substances
NZIoC - New Zealand Inventory of Chemicals

US Federal Regulations

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product contains a chemical or chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

Chemical name	SARA 313 - Threshold Values %
Sulfuric acid (CAS #: 7664-93-9)	1.0
Chloroform (CAS #: 67-66-3)	0.1
Sodium arsenite (CAS #: 7784-46-5)	0.1

SARA 311/312 Hazard Categories

Acute health hazard	Yes
Chronic Health Hazard	Yes
Fire hazard	No
Sudden release of pressure hazard	No
Reactive Hazard	No

CWA (Clean Water Act)

This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

Chemical name	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants	CWA - Hazardous Substances
Sulfuric acid 7664-93-9	1000 lb	-	-	X
Chloroform 67-66-3	10 lb	X	X	X
Sodium arsenite 7784-46-5	1 lb	X	-	X

CERCLA

This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material

Chemical name	Hazardous Substances RQs	CERCLA/SARA RQ	Reportable Quantity (RQ)
Sulfuric acid 7664-93-9	1000 lb	1000 lb	RQ 1000 lb final RQ RQ 454 kg final RQ
Chloroform 67-66-3	10 lb 1 lb	10 lb	RQ 10 lb final RQ RQ 4.54 kg final RQ RQ 1 lb final RQ RQ 0.454 kg final RQ
Sodium arsenite 7784-46-5	1 lb	1 lb	RQ 1 lb final RQ RQ 0.454 kg final RQ

U.S. - Department of Homeland Security - Chemical Facility Anti-Terrorism Standards (CFATS) - Security Issues

Chemical name	U.S. - Department of Homeland Security - Chemical Facility Anti-Terrorism Standards (CFATS) - Security Issues
Chloroform (<1%) CAS#: 67-66-3	Release - Toxic

U.S. - DEA (Drug Enforcement Administration) List I & List II

Chemical name	U.S. - DEA (Drug Enforcement Administration) - List I or Precursor Chemicals	U.S. - DEA (Drug Enforcement Administration) - List II or Essential Chemicals
Sulfuric acid (1 - 5%) CAS#: 7664-93-9	Not Listed	50 gallon Export Volume (exports, transshipments and international transactions to designated countries)

US State Regulations

California Proposition 65
This product contains the following Proposition 65 chemicals

Chemical name	California Proposition 65
Sulfuric acid (CAS #: 7664-93-9)	Carcinogen
Chloroform (CAS #: 67-66-3)	Carcinogen Developmental
Sodium arsenite (CAS #: 7784-46-5)	Carcinogen

⚠**WARNING:** This product can expose you to chemicals including Chloroform, Sulfuric acid, Sodium arsenite, which are known to the State of California to cause cancer or birth defects or reproductive harm.
For more information, go to http://www.P65Warnings.ca.gov

U.S. State Right-to-Know Regulations

Chemical name	New Jersey	Massachusetts	Pennsylvania
Sulfuric acid 7664-93-9	X	X	X
Chloroform 67-66-3	X	X	X
Sodium arsenite 7784-46-5	X	X	X

U.S. EPA Label Information

Chemical name	FIFRA	FDA
Sulfuric acid	180.0910	21 CFR 184.1095

16. OTHER INFORMATION, INCLUDING DATE OF PREPARATION OF THE LAST REVISION

Special Comments
None

Additional information

Global Automotive Declarable Substance List (GADSL)

Chemical name	Global Automotive Declarable Substance List Classifications	Global Automotive Declarable Substance List Thersholds
Sodium arsenite 7784-46-5	Declarable Substance (FA)	0.05 % 0.01 %

NFPA and HMIS Classifications

NFPA	**Health hazards** - 3	**Flammability** - 0	**Instability** - 0	**Physical and Chemical Properties** -
HMIS	**Health hazards** - 3	**Flammability** - 0	**Physical Hazards** - 0	**Personal protection** - X - See section 8 for more information

Key or legend to abbreviations and acronyms used in the safety data sheet

NIOSH IDLH	*Immediately Dangerous to Life or Health*
ACGIH	ACGIH (American Conference of Governmental Industrial Hygienists)
NDF	*no data*

Legend - Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
MAC	Maximum Allowable Concentration	Ceiling	Ceiling Limit Value
X	Listed	Vacated	These values have no official status. The only binding levels of contaminants are those listed in the final OSHA PEL. These lists are for reference purposes only. Please note that some reference state regulations of these "liberated" exposure limits in their state regulations.
SKN*	Skin designation	SKN+	Skin sensitization
RSP+	Respiratory sensitization	**	Hazard Designation
C	Carcinogen	R	Reproductive toxicant
M	mutagen		

Prepared By	Hach Product Compliance Department
Issue Date	16-Aug-2018
Revision Date	16-Aug-2018
Revision Note	None

Disclaimer

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

THE INFORMATION CONTAINED HEREIN IS BASED ON DATA CONSIDERED TO BE ACCURATE. HOWEVER, NO WARRANTY IS EXPRESSED OR IMPLIED REGARDING THE ACCURACY OF THESE DATA OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF.

End of Safety Data Sheet

SAFETY DATA SHEET

1. IDENTIFICATION

Product identifier	
Product Name	DPD Total Chlorine Reagent
Other means of identification	
Product Code(s)	1407699
Safety data sheet number	M00110
HMRIC #	HMIRA Registry Number 9936 Filed 2016-04-11
Recommended use of the chemical and restrictions on use	
Recommended Use	Laboratory reagent. Indicator for total chlorine.
Uses advised against	Consumer use.
Restrictions on use	None.

Details of the supplier of the safety data sheet

Manufacturer Address
Hach Company P.O.Box 389 Loveland, CO 80539 USA +1(970) 669-3050

Emergency telephone number
+1(303) 623-5716 - 24 Hour Service

2. HAZARDS IDENTIFICATION

Classification

Regulatory Status
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 2

Hazards not otherwise classified (HNOC)
Not applicable

Label elements

Signal word
Warning

Hazard statements
H315 - Causes skin irritation
H319 - Causes serious eye irritation

Precautionary statements
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P332 + P313 - If skin irritation occurs: Get medical advice/attention
P362 - Take off contaminated clothing and wash before reuse
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P337 + P313 - If eye irritation persists: Get medical advice/attention

Other Hazards Known
May be harmful if swallowed

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance
Not applicable

Mixture

Chemical Family Mixture.

Chemical name	CAS No.	Percent Range	HMRIC #
Sodium phosphate dibasic	7558-79-4	20 - 30%	-
Potassium iodide (KI)	7681-11-0	20 - 30%	-
Salt of N,N-Diethyl-p-Phenylenediamine	-	1 - 5%	-
Glycine, N,N-1,2-ethanediylbis[N-(carboxymethyl)-, disodium salt, dihydrate	6381-92-6	<1%	-

4. FIRST AID MEASURES

Description of first aid measures

General advice	Show this safety data sheet to the doctor in attendance.
Inhalation	Remove to fresh air. Get medical attention immediately if symptoms occur.
Eye contact	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Keep eye wide open while rinsing. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if irritation develops and persists. Do not rub affected area.
Skin contact	Wash off immediately with soap and plenty of water for at least 15 minutes. Get medical attention if irritation develops and persists.
Ingestion	Clean mouth with water and drink afterwards plenty of water. Never give anything by mouth to an unconscious person. Do NOT induce vomiting. Call a physician.
Self-protection of the first aider	Avoid contact with skin, eyes or clothing.

Most important symptoms and effects, both acute and delayed

Symptoms	Burning sensation.

Indication of any immediate medical attention and special treatment needed

Note to physicians	Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Unsuitable Extinguishing Media	Caution: Use of water spray when fighting fire may be inefficient.
Specific hazards arising from the chemical	No information available.
Hazardous combustion products	Carbon monoxide, Carbon dioxide. Iodine compounds. Phosphorus oxides. Potassium oxides. Sodium monoxide. Nitrogen oxides.
Special protective equipment for fire-fighters	Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear. Use personal protection equipment.

6. ACCIDENTAL RELEASE MEASURES

U.S. Notice	Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance. Outside of the US, only persons properly qualified according to state or local regulations should respond to a spill involving chemicals.

Personal precautions, protective equipment and emergency procedures

Personal precautions	Avoid contact with skin, eyes or clothing. Ensure adequate ventilation. Use personal protective equipment as required.
Other Information	Refer to protective measures listed in Sections 7 and 8.

Environmental precautions

Environmental precautions	Prevent further leakage or spillage if safe to do so.

Methods and material for containment and cleaning up

Methods for containment	Prevent further leakage or spillage if safe to do so.
Methods for cleaning up	Pick up and transfer to properly labeled containers.
Prevention of secondary hazards	Clean contaminated objects and areas thoroughly observing environmental regulations.
Reference to other sections	See section 8 for more information. See section 13 for more information.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling	Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes or clothing. Do not eat, drink or smoke when using this product. Take off contaminated clothing and wash before reuse.

Conditions for safe storage, including any incompatibilities

Storage Conditions	Keep containers tightly closed in a dry, cool and well-ventilated place.
Flammability class	Not applicable

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines

Chemical name	ACGIH TLV	OSHA PEL	NIOSH
Potassium iodide (KI) CAS#: 7681-11-0	TWA: 0.01 ppm inhalable fraction and vapor	NDF	NDF

Appropriate engineering controls

Engineering Controls	Showers Eyewash stations Ventilation systems.

Individual protection measures, such as personal protective equipment

Respiratory protection	No protective equipment is needed under normal use conditions. If exposure limits are exceeded or irritation is experienced, ventilation and evacuation may be required.
Hand Protection	Wear suitable gloves. Impervious gloves.
Eye/face protection	If splashes are likely to occur, wear safety glasses with side-shields.
Skin and body protection	Wear suitable protective clothing. Long sleeved clothing.
General Hygiene Considerations	Wear suitable gloves and eye/face protection. Do not eat, drink or smoke when using this product. Avoid contact with skin, eyes or clothing.
Environmental exposure controls	Local authorities should be advised if significant spillages cannot be contained. Do not allow into any sewer, on the ground or into any body of water.
Thermal hazards	None under normal processing.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state	Solid		
Appearance	powder	**Color**	White to light pink
Odor	Odorless	**Odor threshold**	Not applicable

Property	Values	Remarks • Method
Molecular weight	Not applicable	
pH	No data available	
Melting point/freezing point	145 °C / 293 °F	
Boiling point / boiling range	No data available	
Evaporation rate	Not applicable	
Vapor pressure	Not applicable	

Vapor density (air = 1)	Not applicable
Specific gravity (water = 1 / air = 1)	1.79
Partition Coefficient (n-octanol/water)	log K_{ow} ~ 0
Soil Organic Carbon-Water Partition Coefficient	log K_{oc} ~ 0
Autoignition temperature	No data available
Decomposition temperature	No data available
Dynamic viscosity	Not applicable
Kinematic viscosity	Not applicable

Solubility(ies)

Water solubility

Water solubility classification	Water solubility	Water Solubility Temperature
Soluble	> 1000 mg/L	25 °C / 77 °F

Solubility in other solvents

Chemical Name	Solubility classification	Solubility	Solubility Temperature
None reported	No information available	No data available	No information available

Other Information

Metal Corrosivity

Steel Corrosion Rate	0.97 mm/yr / 0.04 in/yr
Aluminum Corrosion Rate	0.15 mm/yr / 0.01 in/yr

Volatile Organic Compounds (VOC) Content
Not applicable

Chemical name	CAS No.	Volatile organic compounds (VOC) content	CAA (Clean Air Act)
Sodium phosphate dibasic	7558-79-4	No data available	-
Potassium iodide (KI)	7681-11-0	Not applicable	-
Salt of N,N-Diethyl-p-Phenylenediamine	-	Not applicable	-
Glycine, N,N-1,2-ethanediylbis[N-(carboxymethyl)-, disodium salt, dihydrate	6381-92-6	Not applicable	-

Explosive properties

Upper explosion limit	No data available
Lower explosion limit	No data available

Flammable properties

Flash point	Not applicable

Flammability Limit in Air

Upper flammability limit	No data available
Lower flammability limit	No data available
Oxidizing properties	No data available.
Bulk density	No data available

10. STABILITY AND REACTIVITY

Reactivity
Not applicable.

Chemical stability
Stable under normal conditions.

Explosion data

Sensitivity to Mechanical Impact	None.
Sensitivity to Static Discharge	None.

Possibility of Hazardous Reactions
None under normal processing.

Hazardous polymerization
None under normal processing.

Conditions to avoid
None known based on information supplied.

Incompatible materials
Strong acids. Strong bases. Strong oxidizing agents.

Hazardous Decomposition Products
Carbon dioxide. Carbon monoxide. Iodine compounds. Phosphorus oxides. Potassium oxide. Nitrogen oxides.

11. TOXICOLOGICAL INFORMATION

Information on Likely Routes of Exposure

Product Information

Inhalation	May cause irritation of respiratory tract.
Eye contact	Irritating to eyes. Causes serious eye irritation.
Skin contact	Causes skin irritation.
Ingestion	Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.
Symptoms	Redness. May cause redness and tearing of the eyes.

Acute toxicity
Based on available data, the classification criteria are not met

Product Acute Toxicity Data
Test data reported below.

Oral Exposure Route

Endpoint type	Reported dose	Toxicological effects	Key literature references and sources for data
Rat LD_{50}	4700 mg/kg	**Behavioral** Flaccid muscle tone Lethargy Prostration **Eye** Chromodacryorrhea Ptosis **Gastrointestinal** Abnormalities of the gastrointestinal tract Diarrhea **Liver** Abnormalities of the liver **Lungs, Thorax, or Respiration** Abnormalities of the lungs Dyspnea Red or brown staining of the nose/mouth area **Nutritional and Gross Metabolic** Soiling of the anogenital area Wetness of the anogenital area **Reproductive** **Skin and Appendages** Piloerection	Outside testing

Inhalation (Gas) Exposure Route

Ingredient Acute Toxicity Data
No data available.

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Potassium iodide (KI) (20 - 30%) CAS#: 7681-11-0	Rat LD_{50}	2779 mg/kg	None reported	None reported	RTECS (Registry of Toxic Effects of Chemical Substances)
Salt of N,N-Diethyl-p-Phenylenediamine (1 - 5%) CAS#: -	Rat LD_{50}	695 mg/kg	None reported	None reported	Outside testing
Glycine, N,N-1,2-ethanediylbis[N-(carboxymethyl)-, disodium salt, dihydrate (<1%) CAS#: 6381-92-6	Rat LD_{50}	2300 mg/kg	None reported	None reported	RTECS (Registry of Toxic Effects of Chemical Substances)

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Salt of N,N-Diethyl-p-Phenylenediamine (1 - 5%) CAS#: -	None reported	None reported	None reported	None reported	No information available

Unknown Acute Toxicity
0% of the mixture consists of ingredient(s) of unknown toxicity.

Acute Toxicity Estimations (ATE)

ATEmix (oral)	No information available
ATEmix (dermal)	No information available
ATEmix (inhalation-dust/mist)	No information available
ATEmix (inhalation-vapor)	No information available
ATEmix (inhalation-gas)	No information available

Skin corrosion/irritation
Classification based on data available for ingredients. Irritating to skin.

Product Skin Corrosion/Irritation Data
No data available.

Ingredient Skin Corrosion/Irritation Data
No data available.

Chemical name	Test method	Species	Reported dose	Exposure time	Results	Key literature references and sources for data
Sodium phosphate dibasic (20 - 30%) CAS#: 7558-79-4	Standard Draize Test	Rabbit	500 mg	24 hours	Skin irritant	RTECS (Registry of Toxic Effects of Chemical Substances)
Potassium iodide (KI) (20 - 30%) CAS#: 7681-11-0	Standard Draize Test	Rabbit	None reported	None reported	Skin irritant	Vendor SDS
Glycine, N,N-1,2-ethanediylbis [N-(carboxymethyl)-, disodium salt, dihydrate (<1%) CAS#: 6381-92-6	Standard Draize Test	Rabbit	500 mg	20 hours	Not corrosive or irritating to skin	ECHA (The European Chemicals Agency)

Serious eye damage/irritation
Classification based on data available for ingredients. Irritating to eyes.

Product Serious Eye Damage/Eye Irritation Data
No data available.

Ingredient Eye Damage/Eye Irritation Data
No data available.

Chemical name	Test method	Species	Reported dose	Exposure time	Results	Key literature references and sources for data
Sodium phosphate dibasic (20 - 30%)	Standard Draize Test	Rabbit	500 mg	24 hours	Eye irritant	RTECS (Registry of Toxic Effects of Chemical Substances)

CAS#: 7558-79-4						
Potassium iodide (KI) (20 - 30%) CAS#: 7681-11-0	Standard Draize Test	Rabbit	None reported	24 hours	Eye irritant	Vendor SDS
Glycine, N,N-1,2-ethanediylbis [N-(carboxymethyl)-, disodium salt, dihydrate (<1%) CAS#: 6381-92-6	Standard Draize Test	Rabbit	50 mg	None reported	Mild eye irritant	ECHA (The European Chemicals Agency)

Respiratory or skin sensitization

Based on available data, the classification criteria are not met.

Product Sensitization Data
No data available.

Ingredient Sensitization Data
No data available.

Chemical name	Test method	Species	Results	Key literature references and sources for data
Potassium iodide (KI) (20 - 30%) CAS#: 7681-11-0	Patch test	Human	Not confirmed to be a skin sensitizer	ERMA (New Zealands Environmental Risk Management Authority)

STOT - single exposure

Based on available data, the classification criteria are not met.

Product Specific Target Organ Toxicity Single Exposure Data
No data available.

Ingredient Specific Target Organ Toxicity Single Exposure Data
No data available.

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Potassium iodide (KI) (20 - 30%) CAS#: 7681-11-0	Mouse LD_{Lo}	1862 mg/kg	None reported	**Lungs, Thorax, or Respiration** Dyspnea	RTECS (Registry of Toxic Effects of Chemical Substances)

STOT - repeated exposure

Based on available data, the classification criteria are not met.

Product Specific Target Organ Toxicity Repeat Dose Data
No data available.

Ingredient Specific Target Organ Toxicity Repeat Exposure Data
No data available.

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Potassium iodide (KI) (20 - 30%) CAS#: 7681-11-0	Rat NOAEL	0.5 mg/kg	90 days	None reported	ECHA (The European Chemicals Agency)

Carcinogenicity

Based on available data, the classification criteria are not met.

Product Carcinogenicity Data
No data available.

Ingredient Carcinogenicity Data

No data available.

Chemical name	CAS No.	ACGIH	IARC	NTP	OSHA
Sodium phosphate dibasic	7558-79-4	-	-	-	-
Potassium iodide (KI)	7681-11-0	-	-	-	-
Salt of N,N-Diethyl-p-Phenylenediamine	-	-	-	-	-
Glycine, N,N-1,2-ethanediylbis[N-(carboxymethyl)-, disodium salt, dihydrate	6381-92-6	-	-	-	-

Legend

ACGIH (American Conference of Governmental Industrial Hygienists)	Does not apply
IARC (International Agency for Research on Cancer)	Does not apply
NTP (National Toxicology Program)	Does not apply
OSHA (Occupational Safety and Health Administration of the US Department of Labor)	Does not apply

Germ cell mutagenicity
Based on available data, the classification criteria are not met.

Product Germ Cell Mutagenicity *invitro* **Data**
No data available.

Ingredient Germ Cell Mutagenicity *invitro* **Data**
No data available.

Chemical name	Test	Cell Strain	Reported dose	Exposure time	Results	Key literature references and sources for data
Potassium iodide (KI) (20 - 30%) CAS#: 7681-11-0	Cytogenetic analysis	Rat ascites tumor	500 mg/kg	None reported	Positive test result for mutagenicity	RTECS (Registry of Toxic Effects of Chemical Substances)
Glycine, N,N-1,2-ethanediylbis [N-(carboxymethyl)-, disodium salt, dihydrate (<1%) CAS#: 6381-92-6	Cytogenetic analysis	Hamster lung	200 mg/L	None reported	Positive test result for mutagenicity	RTECS (Registry of Toxic Effects of Chemical Substances)

Product Germ Cell Mutagenicity *invivo* **Data**
No data available.

Ingredient Germ Cell Mutagenicity *invivo* **Data**
No data available.

Reproductive toxicity
Based on available data, the classification criteria are not met.

Product Reproductive Toxicity Data
No data available.

Ingredient Reproductive Toxicity Data
No data available.

Chemical name	Endpoint	Reported	Exposure	Toxicological effects	Key literature references and

	type	dose	time		sources for data
Potassium iodide (KI) (20 - 30%) CAS#: 7681-11-0	Human TD_{Lo}	2700 mg/kg	39 weeks	**Specific Developmental Abnormalities** Endocrine System	RTECS (Registry of Toxic Effects of Chemical Substances)

Aspiration hazard
Based on available data, the classification criteria are not met.

12. ECOLOGICAL INFORMATION

Ecotoxicity	Based on available data, the classification criteria are not met.
Unknown aquatic toxicity	0% of the mixture consists of components(s) of unknown hazards to the aquatic environment.

Product Ecological Data

Aquatic Acute Toxicity
No data available.

Aquatic Chronic Toxicity
No data available.

Ingredient Ecological Data

Aquatic Acute Toxicity
No data available.

Chemical name	Exposure time	Species	Endpoint type	Reported dose	Key literature references and sources for data
Glycine, N,N-1,2-ethanediylbis[N-(carboxymethyl)-, disodium salt, dihydrate (<1%) CAS#: 6381-92-6	96 hours	*Lepomis macrochirus*	LC_{50}	159 mg/L	Vendor SDS
Chemical name	**Exposure time**	**Species**	**Endpoint type**	**Reported dose**	**Key literature references and sources for data**
Salt of N,N-Diethyl-p-Phenylenediamine (1 - 5%) CAS#: -	48 Hours	*Daphina magna*	EC_{50}	10.8 mg/L	Internal Data
Chemical name	**Exposure time**	**Species**	**Endpoint type**	**Reported dose**	**Key literature references and sources for data**
Glycine, N,N-1,2-ethanediylbis[N-(carboxymethyl)-, disodium salt, dihydrate (<1%) CAS#: 6381-92-6	72 Hours	None reported	EC_{50}	10 mg/L	Vendor SDS

Aquatic Chronic Toxicity
No data available.

Persistence and degradability

Product Biodegradability Data
No data available.

Bioaccumulation

Product Bioaccumulation Data
No data available.

Partition Coefficient (n-octanol/water)	log K_{ow} ~ 0

Mobility

Soil Organic Carbon-Water Partition Coefficient	log K_{oc} ~ 0

Other adverse effects
Contains a substance with an endocrine-disrupting potential.

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations. Dispose of waste in accordance with environmental legislation.
Contaminated packaging	Do not reuse empty containers.

14. TRANSPORT INFORMATION

DOT	Not regulated
TDG	Not regulated
IATA	Not regulated
IMDG	Not regulated
Note:	No special precautions necessary.

Additional information
There is a possibility that this product could be contained in a reagent set or kit composed of various compatible dangerous goods.
If the item is not in a reagent set or kit, the classification given above applies.
If the item is part of a reagent set or kit the classification would change to the following:
UN3316 Chemical Kit, Hazard Class 9, Packing Group II or III.
If the item is not regulated, the Chemical Kit classification does not apply.

15. REGULATORY INFORMATION

National Inventories

TSCA	Complies
DSL/NDSL	Complies

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

International Inventories

EINECS/ELINCS	Complies
ENCS	Complies
IECSC	Complies
KECL	Complies
PICCS	Complies

TCSI	Complies
AICS	Complies
NZIoC	Complies

EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances
ENCS - Japan Existing and New Chemical Substances
IECSC - China Inventory of Existing Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances
TCSI - Taiwan Chemical Substances Inventory
AICS - Australian Inventory of Chemical Substances
NZIoC - New Zealand Inventory of Chemicals

US Federal Regulations

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

SARA 311/312 Hazard Categories

Acute health hazard	Yes
Chronic Health Hazard	No
Fire hazard	No
Sudden release of pressure hazard	No
Reactive Hazard	No

CWA (Clean Water Act)

This product contains the following substances which are regulated pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

Chemical name	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants	CWA - Hazardous Substances
Sodium phosphate dibasic 7558-79-4	5000 lb	-	-	X

CERCLA

This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Chemical name	Hazardous Substances RQs	CERCLA/SARA RQ	Reportable Quantity (RQ)
Sodium phosphate dibasic 7558-79-4	5000 lb	-	RQ 5000 lb final RQ RQ 2270 kg final RQ

US State Regulations

California Proposition 65

This product does not contain any Proposition 65 chemicals

New Jersey Trade Secret Registry Number 80100131-5001 (Carboxylate Salt) New Jersey Trade Secret Registry Number 80100131-5002 (DPD Salt) New York Trade Secret Registry Number 478 (DPD Salt) New York Trade Secret Registry Number 479 (Carboxylate Salt) This product complies with Pennsylvania Trade Secret Regulations. This product is registered as a trade secret in the state of Illinois. This product is registered as a trade secret in the state of Massachusetts. This product is registered as a trade secret in the state of New York.

U.S. State Right-to-Know Regulations

.

Chemical name	New Jersey	Massachusetts	Pennsylvania
Sodium phosphate dibasic	X	X	X

7558-79-4			

U.S. EPA Label Information

Chemical name	FIFRA	FDA
Sodium phosphate dibasic	180.0910	21 CFR 182.1778,21 CFR 182.6290,21 CFR 182.6778,21 CFR 182.8778
Potassium iodide (KI)	180.0940	21 CFR 184.1634

16. OTHER INFORMATION, INCLUDING DATE OF PREPARATION OF THE LAST REVISION

Special Comments

None

Additional information

Global Automotive Declarable Substance List (GADSL)

Not applicable

NFPA and HMIS Classifications

NFPA	**Health hazards** - 2	**Flammability** - 0	**Instability** - 0	**Physical and chemical properties** -
HMIS	**Health hazards** - 2	**Flammability** - 0	**Physical hazards** - 0	**Personal protection** - X

Key or legend to abbreviations and acronyms used in the safety data sheet

NIOSH IDLH	*Immediately Dangerous to Life or Health*
ACGIH	ACGIH (American Conference of Governmental Industrial Hygienists)
NDF	*no data*

Legend - Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
MAC	Maximum Allowable Concentration	Ceiling	Ceiling Limit Value
X	Listed	Vacated	These values have no official status. The only binding levels of contaminants are those listed in the final OSHA PEL. These lists are for reference purposes only. Please note that some reference state regulations of these "liberated" exposure limits in their state regulations.
SKN*	Skin designation	SKN+	Skin sensitization
RSP+	Respiratory sensitization	**	Hazard Designation
C	Carcinogen	R	Reproductive toxicant
M	mutagen		

Prepared By	Hach Product Compliance Department
Issue Date	16-Sep-2019
Revision Date	17-Oct-2019
Revision Note	None

Disclaimer

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

THE INFORMATION CONTAINED HEREIN IS BASED ON DATA CONSIDERED TO BE ACCURATE. HOWEVER, NO WARRANTY IS EXPRESSED OR IMPLIED REGARDING THE ACCURACY OF THESE DATA OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF.

End of Safety Data Sheet

SAFETY DATA SHEET

1. IDENTIFICATION

Product identifier

Product Name	EDTA Reagent Powder

Other means of identification

Product Code(s)	700599
Safety data sheet number	M00043

Recommended use of the chemical and restrictions on use

Recommended Use	Laboratory reagent.
Uses advised against	Consumer use.
Restrictions on use	For Laboratory Use Only.

Details of the supplier of the safety data sheet

Manufacturer Address
Hach Company P.O.Box 389 Loveland, CO 80539 USA +1(970) 669-3050

Emergency telephone number
+1(303) 623-5716 - 24 Hour Service

2. HAZARDS IDENTIFICATION

Classification

Regulatory Status
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Acute toxicity - Oral	Category 4
Serious eye damage/eye irritation	Category 1

Hazards not otherwise classified (HNOC)
Not applicable

Label elements

Signal word
Danger

Hazard statements
H302 - Harmful if swallowed
H318 - Causes serious eye damage

Precautionary statements
P270 - Do not eat, drink or smoke when using this product
P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
P330 - Rinse mouth
P501 - Dispose of contents/ container to an approved waste disposal plant
P280 - Wear protective gloves, protective clothing, eye protection, and face protection
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician

Other Hazards Known
None

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance

Chemical Name	Tetrasodium EDTA, dihydrate
Chemical Family	Salts of Organic Acids.
Formula	$C_{10}H_{12}N_2Na_4O_8 \cdot 2H_2O$
CAS No	10378-23-1
Alternate CAS Number	64-02-8 - Anhydrous
Chemical nature	Organic Compound.

Percent ranges are used where confidential product information is applicable.

Chemical name	CAS No.	Percent Range	HMRIC #
Tetrasodium EDTA, dihydrate	10378-23-1	100%	-

4. FIRST AID MEASURES

Description of first aid measures

General advice	Show this safety data sheet to the doctor in attendance. Immediate medical attention is required.
Inhalation	Remove to fresh air. Get medical attention immediately if symptoms occur.
Eye contact	Get immediate medical advice/attention. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Keep eye wide open while rinsing. Do not rub affected area.
Skin contact	Wash off immediately with soap and plenty of water for at least 15 minutes. Get medical attention if irritation develops and persists.
Ingestion	Do NOT induce vomiting. Clean mouth with water and drink afterwards plenty of water. Never give anything by mouth to an unconscious person. Call a physician.
Self-protection of the first aider	Avoid contact with skin, eyes or clothing.

Most important symptoms and effects, both acute and delayed

Symptoms	Burning sensation.

Indication of any immediate medical attention and special treatment needed

Note to physicians	Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Unsuitable Extinguishing Media	Caution: Use of water spray when fighting fire may be inefficient.
Specific hazards arising from the chemical	No information available.
Hazardous combustion products	Carbon monoxide, Carbon dioxide. Sodium monoxide. Nitrogen oxides.
Special protective equipment for fire-fighters	Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear. Use personal protection equipment.

6. ACCIDENTAL RELEASE MEASURES

U.S. Notice	Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance. Outside of the US, only persons properly qualified according to state or local regulations should respond to a spill involving chemicals.

Personal precautions, protective equipment and emergency procedures

Personal precautions	Avoid contact with skin, eyes or clothing. Use personal protective equipment as required.
Other Information	Refer to protective measures listed in Sections 7 and 8.

Environmental precautions

Environmental precautions	Prevent further leakage or spillage if safe to do so.

Methods and material for containment and cleaning up

Methods for containment	Prevent further leakage or spillage if safe to do so.
Methods for cleaning up	Pick up and transfer to properly labeled containers.
Prevention of secondary hazards	Clean contaminated objects and areas thoroughly observing environmental regulations.
Reference to other sections	See section 8 for more information. See section 13 for more information.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling	Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes or clothing. Do not eat, drink or smoke when using this product.

Conditions for safe storage, including any incompatibilities

Storage Conditions	Keep containers tightly closed in a dry, cool and well-ventilated place. Keep out of the reach of children. Store locked up.
Flammability class	Not applicable

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines	This product, as supplied, does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies

Appropriate engineering controls

Engineering Controls	Showers Eyewash stations Ventilation systems.

Individual protection measures, such as personal protective equipment

Respiratory protection	No protective equipment is needed under normal use conditions. If exposure limits are exceeded or irritation is experienced, ventilation and evacuation may be required.
Hand Protection	Wear suitable gloves.
Eye/face protection	Tight sealing safety goggles.
Skin and body protection	Wear suitable protective clothing.
General Hygiene Considerations	Avoid contact with skin, eyes or clothing. Wear suitable gloves and eye/face protection. Do not eat, drink or smoke when using this product.
Environmental exposure controls	Local authorities should be advised if significant spillages cannot be contained. Do not allow into any sewer, on the ground or into any body of water.
Thermal hazards	None under normal processing.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state	Solid		
Appearance	powder	**Color**	white
Odor	None	**Odor threshold**	Not applicable

Property	**Values**	**Remarks • Method**
Molecular weight	416.23 g/mole	
pH	11	1% Solution
Melting point/freezing point	> 300 °C / 572 °F	
Boiling point / boiling range	No data available	
Evaporation rate	Not applicable	
Vapor pressure	Not applicable	
Vapor density (air = 1)	Not applicable	

Specific gravity (water = 1 / air = 1)	0.7
Partition Coefficient (n-octanol/water)	No data available
Soil Organic Carbon-Water Partition Coefficient	No data available
Autoignition temperature	No data available
Decomposition temperature	No data available
Dynamic viscosity	Not applicable
Kinematic viscosity	Not applicable

Solubility(ies)

Water solubility

Water solubility classification	Water solubility	Water Solubility Temperature
Completely soluble	1000000 mg/L	20 °C / 68 °F

Solubility in other solvents

Chemical Name	Solubility classification	Solubility	Solubility Temperature
Ethyl alcohol	Soluble	> 1000 mg/L	25 °C / 77 °F

Other Information

Metal Corrosivity

Steel Corrosion Rate	Not applicable
Aluminum Corrosion Rate	Not applicable

Volatile Organic Compounds (VOC) Content
This Product is by Weight 100% an Individual Pure Chemical Substance

Chemical name	CAS No.	Volatile organic compounds (VOC) content	CAA (Clean Air Act)
Tetrasodium EDTA, dihydrate	10378-23-1	Not applicable	-

Explosive properties

Upper explosion limit	No data available
Lower explosion limit	No data available

Flammable properties

Flash point	Not applicable

Flammability Limit in Air

Upper flammability limit	No data available
Lower flammability limit	No data available
Oxidizing properties	No data available.
Bulk density	No data available

10. STABILITY AND REACTIVITY

Reactivity
Not applicable.

Chemical stability
Stable under normal conditions.

Explosion data

Sensitivity to Mechanical Impact	None.
Sensitivity to Static Discharge	None.

Possibility of Hazardous Reactions
None under normal processing.

Hazardous polymerization
Hazardous polymerization does not occur.

Conditions to avoid
None known based on information supplied.

Incompatible materials
Strong acids. Strong bases. Strong oxidizing agents.

Hazardous Decomposition Products
Carbon monoxide. Carbon dioxide. Nitrogen oxides.

11. TOXICOLOGICAL INFORMATION

Information on Likely Routes of Exposure

Product Information

Inhalation	No known effect based on information supplied.
Eye contact	Severely irritating to eyes. Causes serious eye damage. May cause burns. May cause irreversible damage to eyes.
Skin contact	May cause irritation.
Ingestion	Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. Harmful if swallowed.
Symptoms	Redness. Burning. May cause blindness.

Acute toxicity
Harmful if swallowed

Product Acute Toxicity Data
No data available.

Ingredient Acute Toxicity Data
Test data reported below.

Oral Exposure Route

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data

Tetrasodium EDTA, dihydrate (100%) CAS#: 10378-23-1	Rat LD$_{50}$	2700 mg/kg	None reported	None reported	IUCLID (The International Uniform Chemical Information Database)

Unknown Acute Toxicity
0% of the mixture consists of ingredient(s) of unknown toxicity.

Acute Toxicity Estimations (ATE)
Not applicable
The following values are calculated based on chapter 3.1 of the GHS document

ATEmix (oral)	No information available
ATEmix (dermal)	No information available
ATEmix (inhalation-dust/mist)	No information available
ATEmix (inhalation-vapor)	No information available
ATEmix (inhalation-gas)	No information available

Skin corrosion/irritation
May cause skin irritation.

Product Skin Corrosion/Irritation Data
No data available.

Ingredient Skin Corrosion/Irritation Data
No data available.

Serious eye damage/irritation
Classification based on data available for ingredients. Causes burns. Risk of serious damage to eyes.

Product Serious Eye Damage/Eye Irritation Data
No data available.

Ingredient Eye Damage/Eye Irritation Data
No data available.

Respiratory or skin sensitization
Based on available data, the classification criteria are not met.

Product Sensitization Data
No data available.

Ingredient Sensitization Data
No data available.

STOT - single exposure
Based on available data, the classification criteria are not met.

Product Specific Target Organ Toxicity Single Exposure Data
No data available.

Ingredient Specific Target Organ Toxicity Single Exposure Data
No data available.

STOT - repeated exposure
Based on available data, the classification criteria are not met.

Product Specific Target Organ Toxicity Repeat Dose Data
No data available.

Ingredient Specific Target Organ Toxicity Repeat Exposure Data
No data available.

Carcinogenicity
Based on available data, the classification criteria are not met.

Product Carcinogenicity Data
No data available.

Ingredient Carcinogenicity Data
No data available.

Chemical name	CAS No.	ACGIH	IARC	NTP	OSHA
Tetrasodium EDTA, dihydrate	10378-23-1	-	-	-	-

Legend

ACGIH (American Conference of Governmental Industrial Hygienists)	Does not apply
IARC (International Agency for Research on Cancer)	Does not apply
NTP (National Toxicology Program)	Does not apply
OSHA (Occupational Safety and Health Administration of the US Department of Labor)	Does not apply

Germ cell mutagenicity
Based on available data, the classification criteria are not met.

Product Germ Cell Mutagenicity *invitro* **Data**
No data available.

Ingredient Germ Cell Mutagenicity *invitro* **Data**
No data available.

Product Germ Cell Mutagenicity *invivo* **Data**
No data available.

Ingredient Germ Cell Mutagenicity *invivo* **Data**
No data available.

Reproductive toxicity
Based on available data, the classification criteria are not met.

Product Reproductive Toxicity Data
No data available.

Ingredient Reproductive Toxicity Data
No data available.

Aspiration hazard
Based on available data, the classification criteria are not met.

12. ECOLOGICAL INFORMATION

Ecotoxicity	Based on available data, the classification criteria are not met.
Unknown aquatic toxicity	0% of the mixture consists of components(s) of unknown hazards to the aquatic environment.

Product Ecological Data

Aquatic Acute Toxicity
No data available.

Aquatic Chronic Toxicity
No data available.

Ingredient Ecological Data

Aquatic Acute Toxicity
No data available.

Aquatic Chronic Toxicity
No data available.

Persistence and degradability

Product Biodegradability Data
No data available.

Bioaccumulation

Product Bioaccumulation Data
No data available.

Partition Coefficient (n-octanol/water)	No data available

Mobility

Soil Organic Carbon-Water Partition Coefficient	No data available

Other adverse effects
No information available.

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations. Dispose of waste in accordance with environmental legislation.
Contaminated packaging	Do not reuse empty containers.
US EPA Waste Number	Not applicable
Special instructions for disposal	Allow cold water to run for 5 minutes to completely flush the system. Dilute material with excess water making a weaker than 5% solution. If permitted by regulation. Open cold water tap completely, slowly pour the reacted material to the drain. Dispose of material in an E.P.A. approved hazardous waste facility. Adjust to a pH between 6 and 9 with an acid, such as sulfuric or citric.

14. TRANSPORT INFORMATION

DOT	Not regulated
TDG	Not regulated
IATA	Not regulated

IMDG	Not regulated

Additional information

There is a possibility that this product could be contained in a reagent set or kit composed of various compatible dangerous goods.
If the item is not in a reagent set or kit, the classification given above applies.
If the item is part of a reagent set or kit the classification would change to the following:
UN3316 Chemical Kit, Hazard Class 9, Packing Group II or III.
If the item is not regulated, the Chemical Kit classification does not apply.

15. REGULATORY INFORMATION

National Inventories

TSCA	Complies
DSL/NDSL	Complies

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

International Inventories

EINECS/ELINCS	Complies
ENCS	Complies
IECSC	Complies
Existing substances	Complies
PICCS	Complies
TCSI	Complies
AICS	Complies
NZIoC	Complies

EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances
ENCS - Japan Existing and New Chemical Substances
IECSC - China Inventory of Existing Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances
TCSI - Taiwan Chemical Substances Inventory
AICS - Australian Inventory of Chemical Substances
NZIoC - New Zealand Inventory of Chemicals

US Federal Regulations

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

SARA 311/312 Hazard Categories

Acute health hazard	Yes
Chronic Health Hazard	No
Fire hazard	No
Sudden release of pressure hazard	No
Reactive Hazard	No

CWA (Clean Water Act)

This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

CERCLA

This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material

US State Regulations

California Proposition 65
This product does not contain any Proposition 65 chemicals

IMERC: Not applicable

U.S. State Right-to-Know Regulations

This product does not contain any substances regulated by state right-to-know regulations.

U.S. EPA Label Information

16. OTHER INFORMATION, INCLUDING DATE OF PREPARATION OF THE LAST REVISION

Special Comments
None

Additional information

Global Automotive Declarable Substance List (GADSL)
Not applicable
NFPA and HMIS Classifications

NFPA	**Health hazards** - 3	**Flammability** - 0	**Instability** - 0	**Physical and chemical properties** -
HMIS	**Health hazards** - 3	**Flammability** - 0	**Physical hazards** - 0	**Personal protection** - X

Key or legend to abbreviations and acronyms used in the safety data sheet

NIOSH IDLH	*Immediately Dangerous to Life or Health*
ACGIH	ACGIH (American Conference of Governmental Industrial Hygienists)
NDF	*no data*

Legend - Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
MAC	Maximum Allowable Concentration	Ceiling	Ceiling Limit Value
X	Listed	Vacated	These values have no official status. The only binding levels of contaminants are those listed in the final OSHA PEL. These lists are for reference purposes only. Please note that some reference state regulations of these "liberated" exposure limits in their state regulations.
SKN*	Skin designation	SKN+	Skin sensitization
RSP+	Respiratory sensitization	**	Hazard Designation
C	Carcinogen	R	Reproductive toxicant
M	mutagen		

Prepared By Hach Product Compliance Department

Issue Date 20-Nov-2020

Revision Date	20-Nov-2020
Revision Note	None

Disclaimer

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

THE INFORMATION CONTAINED HEREIN IS BASED ON DATA CONSIDERED TO BE ACCURATE. HOWEVER, NO WARRANTY IS EXPRESSED OR IMPLIED REGARDING THE ACCURACY OF THESE DATA OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF.

End of Safety Data Sheet

SAFETY DATA SHEET

Issue Date 26-Sep-2019 **Revision Date** 26-Sep-2019 **Version** 1.3 **Page** 1 / 14

1. IDENTIFICATION

Product identifier

Product Name Free Copper Reagent

Other means of identification

Product Code(s) 2182369

Safety data sheet number M00093

Recommended use of the chemical and restrictions on use

Recommended Use	Laboratory reagent. Indicator for copper.
Uses advised against	None.
Restrictions on use	None.

Details of the supplier of the safety data sheet

Manufacturer Address
Hach Company P.O.Box 389 Loveland, CO 80539 USA +1(970) 669-3050

Emergency telephone number
+1(303) 623-5716 - 24 Hour Service

2. HAZARDS IDENTIFICATION

Classification

Regulatory Status
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Acute toxicity - Oral	Category 4
Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 1
Respiratory sensitization	Category 1
Specific target organ toxicity (single exposure)	Category 3

Hazards not otherwise classified (HNOC)
Not applicable

Label elements

Signal word
Danger

Hazard statements
H302 - Harmful if swallowed
H315 - Causes skin irritation
H318 - Causes serious eye damage
H334 - May cause allergy or asthma symptoms or breathing difficulties if inhaled
H335 - May cause respiratory irritation

Precautionary statements
P270 - Do not eat, drink or smoke when using this product
P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
P330 - Rinse mouth
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P332 + P313 - If skin irritation occurs: Get medical advice/attention
P362 - Take off contaminated clothing and wash before reuse
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
P285 - In case of inadequate ventilation wear respiratory protection
P304 + P341 - IF INHALED: If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing
P342 + P311 - If experiencing respiratory symptoms: Call a POISON CENTER or doctor/physician
P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
P271 - Use only outdoors or in a well-ventilated area
P304 + P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P405 - Store locked up
P501 - Dispose of contents/ container to an approved waste disposal plant

Other Hazards Known
Harmful to aquatic life

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance
Not applicable

Mixture

Percent ranges are used where confidential product information is applicable.

Chemical name	CAS No.	Percent Range	HMRIC #
Sodium chloride	7647-14-5	30 - 40%	-
Sodium metabisulfite	7681-57-4	10 - 20%	-
[2,2-Biquinoline]-4,4-dicarboxylic acid, dipotassium salt	63451-34-3	1 - 5%	-

4. FIRST AID MEASURES

Description of first aid measures

General advice	Show this safety data sheet to the doctor in attendance. Immediate medical attention is required.
Inhalation	Remove to fresh air. May cause allergic respiratory reaction. If breathing has stopped, give artificial respiration. Get medical attention immediately. Avoid direct contact with skin. Use barrier to give mouth-to-mouth resuscitation. Get immediate medical advice/attention.
Eye contact	Get immediate medical advice/attention. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Keep eye wide open while rinsing. Do not rub affected area.
Skin contact	Wash off immediately with soap and plenty of water for at least 15 minutes. May cause an allergic skin reaction. In the case of skin irritation or allergic reactions see a physician.
Ingestion	Do NOT induce vomiting. Clean mouth with water and drink afterwards plenty of water. Never give anything by mouth to an unconscious person. May produce an allergic reaction. Get immediate medical advice/attention.
Self-protection of the first aider	Avoid contact with skin, eyes or clothing. Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination. Avoid direct contact with skin. Use barrier to give mouth-to-mouth resuscitation.

Most important symptoms and effects, both acute and delayed

Symptoms	Burning sensation. May cause allergy or asthma symptoms or breathing difficulties if inhaled. Coughing and/ or wheezing. Itching. Rashes. Hives.

Indication of any immediate medical attention and special treatment needed

Note to physicians	May cause sensitization in susceptible persons. Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Unsuitable Extinguishing Media	Caution: Use of water spray when fighting fire may be inefficient.
Specific hazards arising from the chemical	Product is or contains a sensitizer. May cause sensitization by inhalation and skin contact.
Hazardous combustion products	Nitrogen oxides. Sulfur oxides. Sodium monoxide. Carbon monoxide, Carbon dioxide.
Special protective equipment for fire-fighters	Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear. Use personal protection equipment.

6. ACCIDENTAL RELEASE MEASURES

U.S. Notice	Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance. Outside of the US, only persons properly qualified according to state or local regulations should respond to a spill involving chemicals.

Personal precautions, protective equipment and emergency procedures

Personal precautions	Avoid contact with skin, eyes or clothing. Use personal protective equipment as required. Ensure adequate ventilation. Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak.
Other Information	Refer to protective measures listed in Sections 7 and 8.

Environmental precautions

Environmental precautions	Prevent further leakage or spillage if safe to do so.

Methods and material for containment and cleaning up

Methods for containment	Prevent further leakage or spillage if safe to do so.
Methods for cleaning up	Pick up and transfer to properly labeled containers.
Prevention of secondary hazards	Clean contaminated objects and areas thoroughly observing environmental regulations.
Reference to other sections	See section 8 for more information. See section 13 for more information.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling	Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes or clothing. Do not eat, drink or smoke when using this product. Ensure adequate ventilation. Provide extract ventilation to points where emissions occur. In case of insufficient ventilation, wear suitable respiratory equipment. Remove contaminated clothing and shoes. Take off contaminated clothing and wash before reuse. Avoid breathing vapors or mists.

Conditions for safe storage, including any incompatibilities

Storage Conditions	Keep containers tightly closed in a dry, cool and well-ventilated place. Keep out of the reach of children. Store locked up.
Flammability class	Not applicable

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines

Chemical name	ACGIH TLV	OSHA PEL	NIOSH
Sodium metabisulfite CAS#: 7681-57-4	TWA: 5 mg/m^3	(vacated) TWA: 5 mg/m^3	TWA: 5 mg/m^3

Appropriate engineering controls

Engineering Controls	Showers Eyewash stations Ventilation systems.

Individual protection measures, such as personal protective equipment

Respiratory protection	No protective equipment is needed under normal use conditions. If exposure limits are exceeded or irritation is experienced, ventilation and evacuation may be required.
Hand Protection	Wear suitable gloves. Impervious gloves.

Eye/face protection	Tight sealing safety goggles.
Skin and body protection	Wear suitable protective clothing. Long sleeved clothing.
General Hygiene Considerations	Avoid contact with skin, eyes or clothing. Wear suitable gloves and eye/face protection. Do not eat, drink or smoke when using this product. Remove and wash contaminated clothing and gloves, including the inside, before re-use.
Environmental exposure controls	Local authorities should be advised if significant spillages cannot be contained. Do not allow into any sewer, on the ground or into any body of water.
Thermal hazards	None under normal processing.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state Solid

Appearance	powder	**Color**	White to yellow
Odor	Not determined	**Odor threshold**	No data available

Property	Values	Remarks • Method
Molecular weight	No data available	
pH	5.35	
Melting point/freezing point	203 °C / 397 °F	
Boiling point / boiling range	No data available	
Evaporation rate	Not applicable	
Vapor pressure	Not applicable	
Vapor density (air = 1)	Not applicable	
Specific gravity (water = 1 / air = 1)	1.969	
Partition Coefficient (n-octanol/water)	log K_{ow} ~ -0.75	
Soil Organic Carbon-Water Partition Coefficient	log K_{oc} ~ 0	
Autoignition temperature	No data available	
Decomposition temperature	No data available	
Dynamic viscosity	Not applicable	
Kinematic viscosity	Not applicable	

Solubility(ies)

Water solubility

Water solubility classification	Water solubility	Water Solubility Temperature
Soluble	> 1000 mg/L	25 °C / 77 °F

Solubility in other solvents

Chemical Name	Solubility classification	Solubility	Solubility Temperature
Acid	Soluble	> 1000 mg/L	25 °C / 77 °F

Other Information

Metal Corrosivity

Steel Corrosion Rate	Not applicable
Aluminum Corrosion Rate	Not applicable

Volatile Organic Compounds (VOC) Content
Not applicable

Chemical name	CAS No.	Volatile organic compounds (VOC) content	CAA (Clean Air Act)
Sodium chloride	7647-14-5	Not applicable	-
Sodium metabisulfite	7681-57-4	Not applicable	-
[2,2-Biquinoline]-4,4-dicarboxylic acid, dipotassium salt	63451-34-3	No data available	-

Explosive properties

Upper explosion limit	No data available
Lower explosion limit	No data available

Flammable properties

Flash point	Not applicable

Flammability Limit in Air

Upper flammability limit	No data available
Lower flammability limit	No data available
Oxidizing properties	No data available.
Bulk density	No data available

10. STABILITY AND REACTIVITY

Reactivity
Not applicable.

Chemical stability
Stable under normal conditions.

Explosion data
Sensitivity to Mechanical Impact None.
Sensitivity to Static Discharge None.

Possibility of Hazardous Reactions
None under normal processing.

Hazardous polymerization
None under normal processing.

Conditions to avoid

None known based on information supplied.

Incompatible materials

Strong acids. Strong bases. Strong oxidizing agents.

Hazardous Decomposition Products

Sulfur oxides. Chlorides. Nitrogen oxides. Sodium oxides. Carbon dioxide. Carbon monoxide.

11. TOXICOLOGICAL INFORMATION

Information on Likely Routes of Exposure

Product Information

Inhalation	Specific test data for the substance or mixture is not available. May cause sensitization in susceptible persons. (based on components). May cause irritation of respiratory tract.
Eye contact	Specific test data for the substance or mixture is not available. Severely irritating to eyes. Causes serious eye damage. May cause burns. May cause irreversible damage to eyes. (based on components).
Skin contact	Specific test data for the substance or mixture is not available. Repeated or prolonged skin contact may cause allergic reactions with susceptible persons. (based on components). Causes skin irritation.
Ingestion	Specific test data for the substance or mixture is not available. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. May cause additional affects as listed under "Inhalation". Harmful if swallowed. (based on components).
Symptoms	Redness. Burning. May cause blindness. Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain, or flushing. Coughing and/ or wheezing. May cause redness and tearing of the eyes.

Acute toxicity

Based on available data, the classification criteria are not met

Product Acute Toxicity Data

No data available.

Ingredient Acute Toxicity Data

No data available.

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Sodium chloride (30 - 40%) CAS#: 7647-14-5	Rat LD_{50}	3000 mg/kg	None reported	None reported	IUCLID (The International Uniform Chemical Information Database)
Sodium metabisulfite (10 - 20%) CAS#: 7681-57-4	Rat LD_{50}	500 mg/kg	None reported	None reported	Vendor SDS
Chemical name	**Endpoint type**	**Reported dose**	**Exposure time**	**Toxicological effects**	**Key literature references and sources for data**
Sodium metabisulfite (10 - 20%) CAS#: 7681-57-4	Rat LD_{50}	> 2000 mg/kg	None reported	None reported	LOLI
Chemical name	**Endpoint type**	**Reported dose**	**Exposure time**	**Toxicological effects**	**Key literature references and sources for data**
Sodium metabisulfite	Rat	> 5.5 mg/L	4 hours	None reported	RTECS (Registry of Toxic

(10 - 20%) CAS#: 7681-57-4	LC_{50}				Effects of Chemical Substances)

Unknown Acute Toxicity
0.01% of the mixture consists of ingredient(s) of unknown toxicity.

Acute Toxicity Estimations (ATE)

The following values are calculated based on chapter 3.1 of the GHS document

ATEmix (oral)	1,452.00 mg/kg
ATEmix (dermal)	10,256.00 mg/kg
ATEmix (inhalation-dust/mist)	10.31 mg/L
ATEmix (inhalation-vapor)	No information available
ATEmix (inhalation-gas)	No information available

Skin corrosion/irritation
Classification based on data available for ingredients. Irritating to skin.

Product Skin Corrosion/Irritation Data
No data available.

Ingredient Skin Corrosion/Irritation Data
No data available.

Chemical name	Test method	Species	Reported dose	Exposure time	Results	Key literature references and sources for data
Sodium chloride (30 - 40%) CAS#: 7647-14-5	Standard Draize Test	Rabbit	500 mg	24 hours	Mild skin irritant	RTECS (Registry of Toxic Effects of Chemical Substances)

Serious eye damage/irritation
Classification based on data available for ingredients. Causes burns. Risk of serious damage to eyes.

Product Serious Eye Damage/Eye Irritation Data
No data available.

Ingredient Eye Damage/Eye Irritation Data
No data available.

Chemical name	Test method	Species	Reported dose	Exposure time	Results	Key literature references and sources for data
Sodium chloride (30 - 40%) CAS#: 7647-14-5	Standard Draize Test	Rabbit	100 mg	None reported	Mild eye irritant	RTECS (Registry of Toxic Effects of Chemical Substances)
Sodium metabisulfite (10 - 20%) CAS#: 7681-57-4	Standard Draize Test	Rabbit	107 mg	None reported	Corrosive to eyes	RTECS (Registry of Toxic Effects of Chemical Substances)

Respiratory or skin sensitization
May cause sensitization by inhalation.

Product Sensitization Data
No data available.

Ingredient Sensitization Data
No data available.

Chemical name	Test method	Species	Results	Key literature references and sources for data

Sodium metabisulfite (10 - 20%) CAS#: 7681-57-4	Based on human experience	Human	Confirmed to be a respiratory sensitizer	GESTIS (Information System on Hazardous Substances of the German Social Accident Insurance)

STOT - single exposure

May cause respiratory irritation.

Product Specific Target Organ Toxicity Single Exposure Data

No data available.

Ingredient Specific Target Organ Toxicity Single Exposure Data

No data available.

STOT - repeated exposure

Based on available data, the classification criteria are not met.

Product Specific Target Organ Toxicity Repeat Dose Data

No data available.

Ingredient Specific Target Organ Toxicity Repeat Exposure Data

No data available.

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Sodium metabisulfite (10 - 20%) CAS#: 7681-57-4	Rat TD_{Lo}	75 mg/kg	15 days	**Biochemical** Enzyme inhibition, induction, or change in blood or tissue levels (phosphatases and dehydrogenases) **Kidney, Ureter, or Bladder** Other changes in urine composition	RTECS (Registry of Toxic Effects of Chemical Substances)

Carcinogenicity

Based on available data, the classification criteria are not met.

Product Carcinogenicity Data

No data available.

Ingredient Carcinogenicity Data

No data available.

Chemical name	CAS No.	ACGIH	IARC	NTP	OSHA
Sodium chloride	7647-14-5	-	-	-	-
Sodium metabisulfite	7681-57-4	-	Group 3	-	-
[2,2-Biquinoline]-4,4-dicarboxylic acid, dipotassium salt	63451-34-3	-	-	-	-

Legend

ACGIH (American Conference of Governmental Industrial Hygienists)	Does not apply
IARC (International Agency for Research on Cancer)	Group 3 - Not classifiable as a human carcinogen
NTP (National Toxicology Program)	Does not apply
OSHA (Occupational Safety and Health Administration of the US Department of Labor)	Does not apply

Germ cell mutagenicity

Based on available data, the classification criteria are not met.

Product Germ Cell Mutagenicity *invitro* Data

No data available.

Ingredient Germ Cell Mutagenicity *invitro* Data
No data available.

Chemical name	Test	Cell Strain	Reported dose	Exposure time	Results	Key literature references and sources for data
Sodium metabisulfite (10 - 20%) CAS#: 7681-57-4	Cytogenetic analysis	Hamster ovary	0.18 mg/L	None reported	Positive test result for mutagenicity	RTECS (Registry of Toxic Effects of Chemical Substances)

Product Germ Cell Mutagenicity *invivo* Data
No data available.

Ingredient Germ Cell Mutagenicity *invivo* Data
No data available.

Reproductive toxicity
Based on available data, the classification criteria are not met.

Product Reproductive Toxicity Data
No data available.

Ingredient Reproductive Toxicity Data
No data available.

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Sodium metabisulfite (10 - 20%) CAS#: 7681-57-4	Rat TD_{Lo}	20000 mg/kg	None reported	**Effects on Newborn** Stillbirth	RTECS (Registry of Toxic Effects of Chemical Substances)

Aspiration hazard
Based on available data, the classification criteria are not met.

12. ECOLOGICAL INFORMATION

Ecotoxicity	.
Unknown aquatic toxicity	0.01% of the mixture consists of components(s) of unknown hazards to the aquatic environment.

Product Ecological Data

Aquatic Acute Toxicity
No data available.

Aquatic Chronic Toxicity
No data available.

Ingredient Ecological Data

Aquatic Acute Toxicity
No data available.

Chemical name	Exposure time	Species	Endpoint type	Reported dose	Key literature references and sources for data
Sodium metabisulfite (10 - 20%) CAS#: 7681-57-4	96 hours	*Salmo gairdneri*	LC_{50}	15 mg/L	IUCLID (The International Uniform Chemical Information Database)

[2,2-Biquinoline]-4,4-dicarboxylic acid, dipotassium salt (1 - 5%) CAS#: 63451-34-3	96 hours	None reported	LC_{50}	658 mg/L	Estimation through ECOSARS v1.11 part of the Estimation Programs Interface (EPI) Suite™
Chemical name	**Exposure time**	**Species**	**Endpoint type**	**Reported dose**	**Key literature references and sources for data**
[2,2-Biquinoline]-4,4-dicarboxylic acid, dipotassium salt (1 - 5%) CAS#: 63451-34-3	48 Hours	None reported	LC_{50}	442 mg/L	Estimation through ECOSARS v1.11 part of the Estimation Programs Interface (EPI) Suite™
Chemical name	**Exposure time**	**Species**	**Endpoint type**	**Reported dose**	**Key literature references and sources for data**
Sodium metabisulfite (10 - 20%) CAS#: 7681-57-4	96 hours	*Scenedesmus subspicatus*	EC_{50}	40 mg/L	IUCLID (The International Uniform Chemical Information Database)
[2,2-Biquinoline]-4,4-dicarboxylic acid, dipotassium salt (1 - 5%) CAS#: 63451-34-3	96 hours	None reported	EC_{50}	659 mg/L	Estimation through ECOSARS v1.11 part of the Estimation Programs Interface (EPI) Suite™

Aquatic Chronic Toxicity
No data available.

Persistence and degradability

Product Biodegradability Data
No data available.

Bioaccumulation

Product Bioaccumulation Data
No data available.

Partition Coefficient (n-octanol/water) log K_{ow} ~ -0.75

Mobility

Soil Organic Carbon-Water Partition Coefficient log K_{oc} ~ 0

Other adverse effects
No information available.

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations. Dispose of waste in accordance with environmental legislation.
Contaminated packaging	Do not reuse empty containers.
Special instructions for disposal	Dilute material with excess water making a weaker than 5% solution. Adjust to a pH between 6 and 9 with an alkali, such as soda ash or sodium bicarbonate. Open cold water tap completely, slowly pour the reacted material to the drain. Allow cold water to run for 5 minutes to completely flush the system.

14. TRANSPORT INFORMATION

DOT	Not regulated
TDG	Not regulated
IATA	Not regulated
IMDG	Not regulated

Additional information
There is a possibility that this product could be contained in a reagent set or kit composed of various compatible dangerous goods.
If the item is not in a reagent set or kit, the classification given above applies.
If the item is part of a reagent set or kit the classification would change to the following:
UN3316 Chemical Kit, Hazard Class 9, Packing Group II or III.
If the item is not regulated, the Chemical Kit classification does not apply.

15. REGULATORY INFORMATION

National Inventories

TSCA	Complies
DSL/NDSL	Complies

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

International Inventories

EINECS/ELINCS	Complies
ENCS	Does not comply
IECSC	Complies
KECL	Complies
PICCS	Does not comply
TCSI	Complies
AICS	Does not comply
NZIoC	Complies

EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances
ENCS - Japan Existing and New Chemical Substances
IECSC - China Inventory of Existing Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances
TCSI - Taiwan Chemical Substances Inventory
AICS - Australian Inventory of Chemical Substances
NZIoC - New Zealand Inventory of Chemicals

US Federal Regulations

SARA 313
Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

SARA 311/312 Hazard Categories

Acute health hazard	Yes
Chronic Health Hazard	No
Fire hazard	No
Sudden release of pressure hazard	No
Reactive Hazard	No

CWA (Clean Water Act)

This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

CERCLA

This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material

US State Regulations

California Proposition 65

This product does not contain any Proposition 65 chemicals

U.S. State Right-to-Know Regulations

This product does not contain any substances regulated by state right-to-know regulations.

Chemical name	New Jersey	Massachusetts	Pennsylvania
Sodium metabisulfite 7681-57-4	X	X	X

U.S. EPA Label Information

Chemical name	FIFRA	FDA
Sodium chloride	180.0950	21 CFR 182.70,21 CFR 182.90
Sodium metabisulfite	-	21 CFR 182.3766

16. OTHER INFORMATION, INCLUDING DATE OF PREPARATION OF THE LAST REVISION

Special Comments

None

Additional information

Global Automotive Declarable Substance List (GADSL)

Chemical name	Global Automotive Declarable Substance List Classifications	Global Automotive Declarable Substance List Thersholds
Sodium metabisulfite 7681-57-4	Declarable Substance (LR) Prohibited Substance (LR)	0.0 %

NFPA and HMIS Classifications

NFPA	**Health hazards** - 3	**Flammability** - 0	**Instability** - 0	**Physical and chemical properties** -
HMIS	**Health hazards** - 2 - *	**Flammability** - 0	**Physical hazards** - 0	**Personal protection** - X

Key or legend to abbreviations and acronyms used in the safety data sheet

NIOSH IDLH	*Immediately Dangerous to Life or Health*
ACGIH	ACGIH (American Conference of Governmental Industrial Hygienists)
NDF	*no data*

Legend - Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
MAC	Maximum Allowable Concentration	Ceiling	Ceiling Limit Value
X	Listed	Vacated	These values have no official status. The only binding levels of contaminants are those listed in the final OSHA PEL. These lists are for reference purposes only. Please note that some reference state regulations of these "liberated" exposure limits in their state regulations.
SKN*	Skin designation	SKN+	Skin sensitization
RSP+	Respiratory sensitization	**	Hazard Designation
C	Carcinogen	R	Reproductive toxicant
M	mutagen		

Prepared By	Hach Product Compliance Department
Issue Date	26-Sep-2019
Revision Date	26-Sep-2019
Revision Note	None

Disclaimer

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

THE INFORMATION CONTAINED HEREIN IS BASED ON DATA CONSIDERED TO BE ACCURATE. HOWEVER, NO WARRANTY IS EXPRESSED OR IMPLIED REGARDING THE ACCURACY OF THESE DATA OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF.

End of Safety Data Sheet

SAFETY DATA SHEET

Issue Date 26-Dec-2018 **Revision Date** 26-Dec-2018 **Version** 2.3 **Page** 1 / 12

1. IDENTIFICATION

Product identifier

Product Name	Glass Wool

Other means of identification

Product Code(s)	252074 (U.S. Product Code 252074)
Safety data sheet number	M01529

Recommended use of the chemical and restrictions on use

Recommended Use	Laboratory reagent.
Uses advised against	Consumer use.
Restrictions on use	For Laboratory Use Only.

Details of the supplier of the safety data sheet

Manufacturer Address
Hach Company P.O.Box 389 Loveland, CO 80539 USA +1(970) 669-3050

Emergency telephone number
+1(303) 623-5716 - 24 Hour Service

2. HAZARDS IDENTIFICATION

Classification

Regulatory Status
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Not a dangerous substance or mixture according to the Globally Harmonized System (GHS)

Hazards not otherwise classified (HNOC)
Not applicable

Label elements

Signal word
None

Hazard statements

Other Hazards Known
None

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance

Chemical Name	Glass Wool
Chemical Family	Inorganic Oxides.
CAS No	65997-17-3
Chemical nature	synthetic fiber.

Chemical name	CAS No.	Percent Range	HMRIC #
Glass, oxide, chemicals	65997-17-3	100%	-

4. FIRST AID MEASURES

Description of first aid measures

General advice	No hazards which require special first aid measures. Use first aid treatment according to the nature of the injury.
Inhalation	Remove to fresh air.
Eye contact	Rinse thoroughly with plenty of water for at least 15 minutes, lifting lower and upper eyelids. Consult a physician.
Skin contact	Wash skin with soap and water.
Ingestion	Clean mouth with water and drink afterwards plenty of water.

Most important symptoms and effects, both acute and delayed

Symptoms	See Section 11 for additional Toxicological Information.

Indication of any immediate medical attention and special treatment needed

Note to physicians	Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Unsuitable Extinguishing Media	Caution: Use of water spray when fighting fire may be inefficient.
Specific hazards arising from the chemical	No information available.
Hazardous combustion products	This material will not burn.
Special protective equipment for fire-fighters	Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear.

6. ACCIDENTAL RELEASE MEASURES

U.S. Notice	Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance. Outside of the US, only persons properly qualified according to state or local regulations should respond to a spill involving chemicals.

Personal precautions, protective equipment and emergency procedures

Personal precautions	Ensure adequate ventilation.

Environmental precautions

Environmental precautions	See Section 12 for additional ecological information.

Methods and material for containment and cleaning up

Methods for containment	Prevent further leakage or spillage if safe to do so.
Methods for cleaning up	Pick up and transfer to properly labeled containers.
Prevention of secondary hazards	Clean contaminated objects and areas thoroughly observing environmental regulations.
Reference to other sections	See section 8 for more information. See section 13 for more information.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling	Handle in accordance with good industrial hygiene and safety practice.

Conditions for safe storage, including any incompatibilities

Storage Conditions	Keep containers tightly closed in a dry, cool and well-ventilated place.
Flammability class	Not applicable

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines

Chemical name	ACGIH TLV	OSHA PEL	NIOSH
Glass, oxide, chemicals CAS#: 65997-17-3	TWA: 1 fiber/cm3 TWA: 5 mg/m^3	NDF	NDF

Appropriate engineering controls

Engineering Controls	Showers Eyewash stations Ventilation systems.

Individual protection measures, such as personal protective equipment

Respiratory protection	No protective equipment is needed under normal use conditions. If exposure limits are exceeded or irritation is experienced, ventilation and evacuation may be required.
Hand Protection	Wear suitable gloves.
Eye/face protection	Wear safety glasses with side shields (or goggles).
Skin and body protection	No special protective equipment required.
General Hygiene Considerations	Handle in accordance with good industrial hygiene and safety practice.
Environmental exposure controls	Local authorities should be advised if significant spillages cannot be contained. Do not

allow into any sewer, on the ground or into any body of water.

Thermal hazards	None under normal processing.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state	Solid		
Appearance	fibers	**Color**	white
Odor	Odorless	**Odor threshold**	Not applicable

Property	Values	Remarks • Method
Molecular weight	No data available	
pH	No data available	
Melting point/freezing point	815 °C / 1499 °F	
Boiling point / boiling range	> 1000 °C / 1832 °F	
Evaporation rate	Not applicable	
Vapor pressure	Not applicable	
Vapor density (air = 1)	Not applicable	
Specific gravity (water = 1 / air = 1)	2.54	
Partition Coefficient (n-octanol/water)	No data available	
Soil Organic Carbon-Water Partition Coefficient	No data available	
Autoignition temperature	No data available	
Decomposition temperature	No data available	
Dynamic viscosity	Not applicable	
Kinematic viscosity	Not applicable	

Solubility(ies)

Water solubility

Water solubility classification	Water solubility	Water Solubility Temperature
Insoluble	< 0.1 mg/L	25 °C / 77 °F

Solubility in other solvents

Chemical Name	Solubility classification	Solubility	Solubility Temperature
None reported	No information available	No data available	No information available

Other Information

Metal Corrosivity

Steel Corrosion Rate	Not applicable
Aluminum Corrosion Rate	Not applicable

Volatile Organic Compounds (VOC) Content

This Product is by Weight 100% an Individual Pure Chemical Substance

Chemical name	CAS No.	Volatile organic compounds (VOC) content	CAA (Clean Air Act)
Glass, oxide, chemicals	65997-17-3	Not applicable	-

Explosive properties

Upper explosion limit	Not applicable
Lower explosion limit	Not applicable

Flammable properties

Flash point	Not applicable

Flammability Limit in Air

Upper flammability limit	No data available
Lower flammability limit	No data available
Oxidizing properties	No data available.
Bulk density	No data available

10. STABILITY AND REACTIVITY

Reactivity
Not applicable.

Chemical stability
Stable under normal conditions.

Explosion data

Sensitivity to Mechanical Impact	None.
Sensitivity to Static Discharge	None.

Possibility of Hazardous Reactions
None under normal processing.

Hazardous polymerization
Hazardous polymerization does not occur.

Conditions to avoid
None known based on information supplied.

Incompatible materials
Strong oxidizing agents, strong acids, and strong bases.

Hazardous Decomposition Products
metal oxides.

11. TOXICOLOGICAL INFORMATION

Information on Likely Routes of Exposure

Product Information

Inhalation	No known effect based on information supplied.
Eye contact	No known effect based on information supplied.
Skin contact	No known effect based on information supplied.
Ingestion	No known effect based on information supplied.
Symptoms	No information available.

Acute toxicity

Product Acute Toxicity Data
If available, see ingredient data below.

Ingredient Acute Toxicity Data
No data available.

Unknown Acute Toxicity
0% of the mixture consists of ingredient(s) of unknown toxicity.

Acute Toxicity Estimations (ATE)
Not applicable

ATEmix (oral)	No information available
ATEmix (dermal)	No information available
ATEmix (inhalation-dust/mist)	No information available
ATEmix (inhalation-vapor)	No information available
ATEmix (inhalation-gas)	No information available

Skin corrosion/irritation

Based on available data, the classification criteria are not met.

Product Skin Corrosion/Irritation Data
If available, see ingredient data below.

Ingredient Skin Corrosion/Irritation Data
No data available.

Chemical name	Test method	Species	Reported dose	Exposure time	Results	Key literature references and sources for data
Glass, oxide, chemicals (100%) CAS#: 65997-17-3	Organization for Economic Co-operation and Development (OECD) - Test 404: Acute Dermal Corrosion/Irritation	Rabbit	500 mg	24 hours	Not corrosive or irritating to skin	ECHA (The European Chemicals Agency)

Serious eye damage/irritation

Based on available data, the classification criteria are not met.

Product Serious Eye Damage/Eye Irritation Data
If available, see ingredient data below.

Ingredient Eye Damage/Eye Irritation Data
No data available.

Chemical name	Test method	Species	Reported dose	Exposure time	Results	Key literature references and sources for data

Glass, oxide, chemicals (100%) CAS#: 65997-17-3	Organization for Economic Co-operation and Development (OECD) - Test 405: Acute Eye Corrosion/Irritation	Rabbit	100 mg	72 hours	Not corrosive or irritating to eyes	ECHA (The European Chemicals Agency)

Respiratory or skin sensitization

Based on available data, the classification criteria are not met.

Product Sensitization Data
If available, see ingredient data below.

Ingredient Sensitization Data
No data available.

Chemical name	Test method	Species	Results	Key literature references and sources for data
Glass, oxide, chemicals (100%) CAS#: 65997-17-3	OECD Test No. 406: Skin Sensitization	Guinea pig	Not confirmed to be a skin sensitizer	ECHA (The European Chemicals Agency)

STOT - single exposure

Based on available data, the classification criteria are not met.

Product Specific Target Organ Toxicity Single Exposure Data
If available, see ingredient data below.

Ingredient Specific Target Organ Toxicity Single Exposure Data
No data available.

STOT - repeated exposure

Based on available data, the classification criteria are not met.

Product Specific Target Organ Toxicity Repeat Dose Data
If available, see ingredient data below.

Ingredient Specific Target Organ Toxicity Repeat Exposure Data
No data available.

Carcinogenicity

Based on available data, the classification criteria are not met.

Product Carcinogenicity Data
If available, see ingredient data below.

Ingredient Carcinogenicity Data
No data available.

Chemical name	CAS No.	ACGIH	IARC	NTP	OSHA
Glass, oxide, chemicals	65997-17-3	-	Group 3	-	-

Legend

ACGIH (American Conference of Governmental Industrial Hygienists)	Does not apply
IARC (International Agency for Research on Cancer)	Group 3 - Not classifiable as a human carcinogen
NTP (National Toxicology Program)	Does not apply
OSHA (Occupational Safety and Health Administration of the US Department of Labor)	Does not apply

Germ cell mutagenicity
Based on available data, the classification criteria are not met.

Product Germ Cell Mutagenicity *invitro* **Data**
If available, see ingredient data below.

Ingredient Germ Cell Mutagenicity *invitro* **Data**
No data available.

Chemical name	Test	Cell Strain	Reported dose	Exposure time	Results	Key literature references and sources for data
Glass, oxide, chemicals (100%) CAS#: 65997-17-3	Mammalian gene cell mutation	Hamster ovary	0.001 mmol/L	None reported	Positive test result for mutagenicity	ECHA (The European Chemicals Agency)

Product Germ Cell Mutagenicity *invivo* **Data**
If available, see ingredient data below.

Ingredient Germ Cell Mutagenicity *invivo* **Data**
No data available.

Reproductive toxicity
Based on available data, the classification criteria are not met.

Product Reproductive Toxicity Data
No data available.

Ingredient Reproductive Toxicity Data
No data available.

Aspiration hazard
Based on available data, the classification criteria are not met.

12. ECOLOGICAL INFORMATION

Ecotoxicity	Based on available data, the classification criteria are not met.
Unknown aquatic toxicity	0% of the mixture consists of components(s) of unknown hazards to the aquatic environment.

Product Ecological Data

Aquatic Acute Toxicity
If available, see ingredient data below.

Aquatic Chronic Toxicity
If available, see ingredient data below.

Ingredient Ecological Data

Aquatic Acute Toxicity
No data available.

Aquatic Chronic Toxicity
No data available.

Persistence and degradability

Product Biodegradability Data
No data available.

Bioaccumulation

Product Bioaccumulation Data
No data available.

Partition Coefficient (n-octanol/water)	No data available

Mobility

Soil Organic Carbon-Water Partition Coefficient	No data available

Other adverse effects
No information available.

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations. Dispose of waste in accordance with environmental legislation.
Contaminated packaging	Do not reuse empty containers.
US EPA Waste Number	Not applicable
Special instructions for disposal	Place material in a plastic bag. Mark bag 'Non-hazardous trash', and dispose of as normal refuse.

14. TRANSPORT INFORMATION

U.S. DOT	Not regulated
TDG	Not regulated
IATA	Not regulated
IMDG	Not regulated

Additional information
There is a possibility that this product could be contained in a reagent set or kit composed of various compatible dangerous goods.
If the item is not in a reagent set or kit, the classification given above applies.
If the item is part of a reagent set or kit the classification would change to the following:
UN3316 Chemical Kit, Hazard Class 9, Packing Group II or III.
If the item is not regulated, the Chemical Kit classification does not apply.

15. REGULATORY INFORMATION

National Inventories

TSCA	Complies
DSL/NDSL	Complies

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

International Inventories

EINECS/ELINCS	Complies

ENCS	Complies
IECSC	Complies
KECL	Complies
PICCS	Complies
TCSI	Complies
AICS	Complies
NZIoC	Complies

EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances
ENCS - Japan Existing and New Chemical Substances
IECSC - China Inventory of Existing Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances
TCSI - Taiwan Chemical Substances Inventory
AICS - Australian Inventory of Chemical Substances
NZIoC - New Zealand Inventory of Chemicals

US Federal Regulations

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

SARA 311/312 Hazard Categories

Acute health hazard	Yes
Chronic Health Hazard	Yes
Fire hazard	No
Sudden release of pressure hazard	No
Reactive Hazard	No

CWA (Clean Water Act)

This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

CERCLA

This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material

US State Regulations

California Proposition 65

This product contains the following Proposition 65 chemicals

Chemical name	California Proposition 65
Glass, oxide, chemicals (CAS #: 65997-17-3)	Carcinogen

⚠**WARNING:** This product can expose you to chemicals including Glass, oxide, chemicals, which is known to the State of California to cause cancer.
For more information, go to http://www.P65Warnings.ca.gov

IMERC: Not applicable

U.S. State Right-to-Know Regulations

This product does not contain any substances regulated by state right-to-know regulations.

U.S. EPA Label Information

16. OTHER INFORMATION, INCLUDING DATE OF PREPARATION OF THE LAST REVISION

Special Comments
None

Additional information

Global Automotive Declarable Substance List (GADSL)
Not applicable
NFPA and HMIS Classifications

NFPA	**Health hazards** - 0	**Flammability** - 0	**Instability** - 0	**Physical and chemical properties** -
HMIS	**Health hazards** - 0	**Flammability** - 0	**Physical hazards** - 0	**Personal protection** - X

Key or legend to abbreviations and acronyms used in the safety data sheet

NIOSH IDLH	*Immediately Dangerous to Life or Health*
ACGIH	ACGIH (American Conference of Governmental Industrial Hygienists)
NDF	*no data*

Legend - Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
MAC	Maximum Allowable Concentration	Ceiling	Ceiling Limit Value
X	Listed	Vacated	These values have no official status. The only binding levels of contaminants are those listed in the final OSHA PEL. These lists are for reference purposes only. Please note that some reference state regulations of these "liberated" exposure limits in their state regulations.
SKN*	Skin designation	SKN+	Skin sensitization
RSP+	Respiratory sensitization	**	Hazard Designation
C	Carcinogen	R	Reproductive toxicant
M	mutagen		

Prepared By	Hach Product Compliance Department
Issue Date	26-Dec-2018
Revision Date	26-Dec-2018
Revision Note	SDS sections updated 2

Disclaimer

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

THE INFORMATION CONTAINED HEREIN IS BASED ON DATA CONSIDERED TO BE ACCURATE. HOWEVER, NO WARRANTY IS EXPRESSED OR IMPLIED REGARDING THE ACCURACY OF THESE DATA OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF.

End of Safety Data Sheet

SAFETY DATA SHEET

Issue Date 26-Sep-2019 **Revision Date** 26-Sep-2019 **Version** 4.2 **Page** 1 / 14

1. IDENTIFICATION

Product identifier

Product Name	Hydrosulfite Reagent for Total Copper

Other means of identification

Product Code(s)	2118869
Safety data sheet number	M00107
UN/ID no	UN1384

Recommended use of the chemical and restrictions on use

Recommended Use	Laboratory Use.
Uses advised against	Consumer use.
Restrictions on use	For Laboratory Use Only.

Details of the supplier of the safety data sheet

Manufacturer Address
Hach Company P.O.Box 389 Loveland, CO 80539 USA +1(970) 669-3050

Emergency telephone number
+1(303) 623-5716 - 24 Hour Service

2. HAZARDS IDENTIFICATION

Classification

Regulatory Status
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Self-heating substances and mixtures	Category 1
Acute toxicity - Oral	Category 4
Serious eye damage/eye irritation	Category 2A
Chronic aquatic toxicity	Category 3

Hazards not otherwise classified (HNOC)
Not applicable

Label elements

Signal word
Danger

Hazard statements
H251 - Self-heating: may catch fire
H302 - Harmful if swallowed
H319 - Causes serious eye irritation
H412 - Harmful to aquatic life with long lasting effects

Precautionary statements
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P337 + P313 - If eye irritation persists: Get medical advice/attention
P273 - Avoid release to the environment
P501 - Dispose of contents/ container to an approved waste disposal plant
P235 + P410 - Keep cool. Protect from sunlight
P407 - Maintain air gap between stacks/pallets
P420 - Store away from other materials
P270 - Do not eat, drink or smoke when using this product
P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
P330 - Rinse mouth

Other Hazards Known
Causes mild skin irritation
Harmful to aquatic life

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance

Chemical Name	Sodium Hydrosulfite
Chemical Family	Reducing agent.
Formula	$Na_2S_2O_4$
CAS No	7775-14-6
Chemical nature	Inorganic Compound.

Percent ranges are used where confidential product information is applicable.

Chemical name	CAS No.	Percent Range	HMRIC #
Sodium dithionite	7775-14-6	100%	-

4. FIRST AID MEASURES

Description of first aid measures

General advice	Show this safety data sheet to the doctor in attendance.
Inhalation	Remove to fresh air.
Eye contact	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Keep eye wide open while rinsing. Do not rub affected area. Get medical attention if irritation develops and persists.
Skin contact	Wash skin with soap and water.
Ingestion	Do NOT induce vomiting. Clean mouth with water and drink afterwards plenty of water. Never give anything by mouth to an unconscious person. Call a physician.
Self-protection of the first aider	Avoid contact with skin, eyes or clothing.

Most important symptoms and effects, both acute and delayed

Symptoms	Burning sensation.

Indication of any immediate medical attention and special treatment needed

Note to physicians	Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Unsuitable Extinguishing Media	Caution: Use of water spray when fighting fire may be inefficient.
Specific hazards arising from the chemical	No information available.
Hazardous combustion products	Sodium monoxide. Sulfur oxides.
Special protective equipment for fire-fighters	Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear. Use personal protection equipment.

6. ACCIDENTAL RELEASE MEASURES

U.S. Notice	Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance. Outside of the US, only persons properly qualified according to state or local regulations should respond to a spill involving chemicals.

Personal precautions, protective equipment and emergency procedures

Personal precautions	Avoid contact with skin, eyes or clothing. Use personal protective equipment as required.
Other Information	Refer to protective measures listed in Sections 7 and 8.

Environmental precautions

Environmental precautions	See Section 12 for additional ecological information.

Methods and material for containment and cleaning up

Methods for containment	Prevent further leakage or spillage if safe to do so.
Methods for cleaning up	Pick up and transfer to properly labeled containers.
Prevention of secondary hazards	Clean contaminated objects and areas thoroughly observing environmental regulations.
Reference to other sections	See section 8 for more information. See section 13 for more information.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling	Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes or clothing. Do not eat, drink or smoke when using this product.

Conditions for safe storage, including any incompatibilities

Storage Conditions	Keep containers tightly closed in a dry, cool and well-ventilated place. Keep out of the reach of children.
Flammability class	Not applicable

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines	This product, as supplied, does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies

Appropriate engineering controls

Engineering Controls	Showers Eyewash stations Ventilation systems.

Individual protection measures, such as personal protective equipment

Respiratory protection	No protective equipment is needed under normal use conditions. If exposure limits are exceeded or irritation is experienced, ventilation and evacuation may be required.
Hand Protection	Wear suitable gloves.
Eye/face protection	If splashes are likely to occur, wear safety glasses with side-shields.
Skin and body protection	Wear suitable protective clothing.
General Hygiene Considerations	Avoid contact with skin, eyes or clothing. Wear suitable gloves and eye/face protection. Do not eat, drink or smoke when using this product.
Environmental exposure controls	Local authorities should be advised if significant spillages cannot be contained. Do not allow into any sewer, on the ground or into any body of water.
Thermal hazards	None under normal processing.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state Solid
Appearance powder
Color white
Odor Sulfur-like
Odor threshold No data available

Property	Values	Remarks • Method
Molecular weight	174.10 g/mole	
pH	3.0	
Melting point/freezing point	No data available	
Boiling point / boiling range	No data available	
Evaporation rate	Not applicable	
Vapor pressure	Not applicable	
Vapor density (air = 1)	Not applicable	
Specific gravity (water = 1 / air = 1)	2.2	
Partition Coefficient (n-octanol/water)	log $K_{ow} < -7.53$	Estimation through KOWWIN v1.68 part of the Estimation Programs Interface (EPI) Suite™
Soil Organic Carbon-Water Partition Coefficient	log $K_{oc} < -0.62$	Estimation through KOCWIN v2.00 part of the Estimation Programs Interface (EPI) Suite™
Autoignition temperature	100 °C / 212 °F	
Decomposition temperature	100 °C / 212 °F	
Dynamic viscosity	Not applicable	
Kinematic viscosity	Not applicable	

Solubility(ies)

Water solubility

Water solubility classification	Water solubility	Water Solubility Temperature
Completely soluble	250000 mg/L	20 °C / 68 °F

Solubility in other solvents

Chemical Name	Solubility classification	Solubility	Solubility Temperature
Acids	Insoluble	< 0.1 mg/L	25 °C / 77 °F

Other Information

Metal Corrosivity

Steel Corrosion Rate Not applicable
Aluminum Corrosion Rate Not applicable

Volatile Organic Compounds (VOC) Content

This Product is by Weight 100% an Individual Pure Chemical Substance

Chemical name	CAS No.	Volatile organic compounds (VOC) content	CAA (Clean Air Act)
Sodium dithionite	7775-14-6	No data available	-

Explosive properties

Upper explosion limit	No data available
Lower explosion limit	No data available

Flammable properties

Flash point	Not applicable

Flammability Limit in Air

Upper flammability limit	No data available
Lower flammability limit	No data available
Oxidizing properties	No data available.
Bulk density	1250 kg/m³

10. STABILITY AND REACTIVITY

Reactivity
Not applicable.

Chemical stability
Fire hazard.

Explosion data

Sensitivity to Mechanical Impact	None.
Sensitivity to Static Discharge	None.

Possibility of Hazardous Reactions
Self-heating; may catch fire.

Hazardous polymerization
Hazardous polymerization does not occur.

Conditions to avoid
Heat.

Incompatible materials
Strong acids. Strong bases. Strong oxidizing agents. Combustible material.

Hazardous Decomposition Products
Sulfur oxides.

11. TOXICOLOGICAL INFORMATION

Information on Likely Routes of Exposure

Product Information

Inhalation	May cause irritation of respiratory tract.
Eye contact	Causes serious eye irritation. May cause redness, itching, and pain.
Skin contact	May cause irritation. Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. Harmful if swallowed.
Symptoms	May cause redness and tearing of the eyes.

Acute toxicity
Harmful if swallowed

Product Acute Toxicity Data
If available, see ingredient data below.

Ingredient Acute Toxicity Data
Test data reported below.

Oral Exposure Route

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Sodium dithionite (100%) CAS#: 7775-14-6	Mouse LD_{50}	1500 mg/kg	None reported	None reported	ERMA (New Zealands Environmental Risk Management Authority)

Unknown Acute Toxicity
0% of the mixture consists of ingredient(s) of unknown toxicity.

Acute Toxicity Estimations (ATE)
Not applicable
The following values are calculated based on chapter 3.1 of the GHS document

ATEmix (oral)	No information available
ATEmix (dermal)	No information available
ATEmix (inhalation-dust/mist)	No information available
ATEmix (inhalation-vapor)	No information available
ATEmix (inhalation-gas)	No information available

Skin corrosion/irritation
May cause skin irritation.

Product Skin Corrosion/Irritation Data
If available, see ingredient data below.

Ingredient Skin Corrosion/Irritation Data
Test data reported below.

Chemical name	Test method	Species	Reported dose	Exposure time	Results	Key literature references and sources for data
Sodium dithionite (100%) CAS#: 7775-14-6	Standard Draize Test	Rabbit	800 mg	None reported	Mild skin irritant	IUCLID (The International Uniform Chemical Information Database)

Serious eye damage/irritation

Classification based on data available for ingredients. Irritating to eyes.

Product Serious Eye Damage/Eye Irritation Data
If available, see ingredient data below.

Ingredient Eye Damage/Eye Irritation Data
Test data reported below.

Chemical name	Test method	Species	Reported dose	Exposure time	Results	Key literature references and sources for data
Sodium dithionite (100%) CAS#: 7775-14-6	Standard Draize Test	Rabbit	100 mg	None reported	Eye irritant	IUCLID (The International Uniform Chemical Information Database)

Respiratory or skin sensitization

Based on available data, the classification criteria are not met.

Product Sensitization Data
If available, see ingredient data below.

Ingredient Sensitization Data
Test data reported below.

Skin Sensitization Exposure Route

Chemical name	Test method	Species	Results	Key literature references and sources for data
Sodium dithionite (100%) CAS#: 7775-14-6	Based on human experience	Human	Not confirmed to be a skin sensitizer	OECD 429: Skin Sensitization: Local Lymph Node Assay

STOT - single exposure

Based on available data, the classification criteria are not met.

Product Specific Target Organ Toxicity Single Exposure Data
If available, see ingredient data below.

Ingredient Specific Target Organ Toxicity Single Exposure Data
No data available.

STOT - repeated exposure

Based on available data, the classification criteria are not met.

Product Specific Target Organ Toxicity Repeat Dose Data
If available, see ingredient data below.

Ingredient Specific Target Organ Toxicity Repeat Exposure Data
Test data reported below.

Oral Exposure Route

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Sodium dithionite (100%) CAS#: 7775-14-6	Rat NOAEL	217 mg/kg	None reported	None reported	OECD 429: Skin Sensitization: Local Lymph Node Assay

Carcinogenicity

Based on available data, the classification criteria are not met.

Product Carcinogenicity Data
If available, see ingredient data below.

Ingredient Carcinogenicity Data
Test data reported below.

Chemical name	CAS No.	ACGIH	IARC	NTP	OSHA
Sodium dithionite	7775-14-6	-	-	-	-

Legend

ACGIH (American Conference of Governmental Industrial Hygienists)	Does not apply
IARC (International Agency for Research on Cancer)	Does not apply
NTP (National Toxicology Program)	Does not apply
OSHA (Occupational Safety and Health Administration of the US Department of Labor)	Does not apply

Oral Exposure Route

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Sodium dithionite (100%) CAS#: 7775-14-6	None reported	942 mg/kg	2 years	Negative results for carcinogenicity	No information available

Germ cell mutagenicity
Based on available data, the classification criteria are not met.

Product Germ Cell Mutagenicity *invitro* **Data**
If available, see ingredient data below.

Ingredient Germ Cell Mutagenicity *invitro* **Data**
Test data reported below.

Chemical name	Test	Cell Strain	Reported dose	Exposure time	Results	Key literature references and sources for data
Sodium dithionite (100%) CAS#: 7775-14-6	Mutation in microorganisms	*Salmonella typhimurium*	None reported	None reported	Negative test result for mutagenicity	IUCLID (The International Uniform Chemical Information Database)

Product Germ Cell Mutagenicity *invivo* **Data**
If available, see ingredient data below.

Ingredient Germ Cell Mutagenicity *invivo* **Data**
Test data reported below.

Oral Exposure Route

Chemical name	Test	Species	Reported dose	Exposure time	Results	Key literature references and sources for data
Sodium dithionite (100%) CAS#: 7775-14-6	Cytogenetic analysis	Rat	1200 mg/kg	None reported	Negative test result for mutagenicity	IUCLID (The International Uniform Chemical Information

						Database)

Reproductive toxicity

Based on available data, the classification criteria are not met.

Product Reproductive Toxicity Data

No data available.

Ingredient Reproductive Toxicity Data

No data available.

Aspiration hazard

Based on available data, the classification criteria are not met.

12. ECOLOGICAL INFORMATION

Ecotoxicity	Harmful to aquatic life with long lasting effects.
Unknown aquatic toxicity	0% of the mixture consists of components(s) of unknown hazards to the aquatic environment.

Product Ecological Data

Aquatic Acute Toxicity

If available, see ingredient data below.

Aquatic Chronic Toxicity

If available, see ingredient data below.

Ingredient Ecological Data

Aquatic Acute Toxicity

Test data reported below.

Fish

Chemical name	Exposure time	Species	Endpoint type	Reported dose	Key literature references and sources for data
Sodium dithionite (100%) CAS#: 7775-14-6	96 hours	*Leuciscus idus*	LC_{50}	>= 46 mg/L	IUCLID (The International Uniform Chemical Information Database)

Crustacea

Chemical name	Exposure time	Species	Endpoint type	Reported dose	Key literature references and sources for data
Sodium dithionite (100%) CAS#: 7775-14-6	48 Hours	*Daphnia magna*	EC_{50}	98 mg/L	IUCLID (The International Uniform Chemical Information Database)

Aquatic Chronic Toxicity

No data available.

Persistence and degradability

Product Biodegradability Data

No data available.

Bioaccumulation

Product Bioaccumulation Data
No data available.

Partition Coefficient (n-octanol/water)	log K_{ow} < -7.53

Mobility

Soil Organic Carbon-Water Partition Coefficient	log K_{oc} < -0.62

Other adverse effects
Global warming potential.

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations. Dispose of waste in accordance with environmental legislation.
Contaminated packaging	Do not reuse empty containers.
US EPA Waste Number	D001
Special instructions for disposal	Incinerate material at an E.P.A. approved hazardous waste facility.

14. TRANSPORT INFORMATION

DOT

UN/ID no	UN1384
Proper shipping name	Sodium dithionite
Hazard Class	4.2
Packing Group	II
Description	UN1384, Sodium dithionite, 4.2, II
Emergency Response Guide Number	135

TDG

UN/ID no	UN1384
Proper shipping name	Sodium dithionite
Hazard Class	4.2
Packing Group	II
Description	UN1384, Sodium dithionite, 4.2, II

IATA

UN/ID no	UN1384
Proper shipping name	Sodium dithionite
Hazard Class	4.2
Packing Group	II
ERG Code	4L

IMDG

UN/ID no	UN1384
Proper shipping name	Sodium dithionite
Hazard Class	4.2
Packing Group	II
EmS-No	F-A, S-J

Note: No special precautions necessary.

Additional information
There is a possibility that this product could be contained in a reagent set or kit composed of various compatible dangerous goods.
If the item is not in a reagent set or kit, the classification given above applies.
If the item is part of a reagent set or kit the classification would change to the following:
UN3316 Chemical Kit, Hazard Class 9, Packing Group II or III.
If the item is not regulated, the Chemical Kit classification does not apply.

15. REGULATORY INFORMATION

National Inventories

TSCA	Complies
DSL/NDSL	Complies

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

International Inventories

EINECS/ELINCS	Complies
ENCS	Complies
IECSC	Complies
KECL	Complies
PICCS	Complies
TCSI	Complies
AICS	Complies
NZIoC	Complies

EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances
ENCS - Japan Existing and New Chemical Substances
IECSC - China Inventory of Existing Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances
TCSI - Taiwan Chemical Substances Inventory
AICS - Australian Inventory of Chemical Substances
NZIoC - New Zealand Inventory of Chemicals

US Federal Regulations

SARA 313
Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

SARA 311/312 Hazard Categories

Acute health hazard	Yes
Chronic Health Hazard	No
Fire hazard	No
Sudden release of pressure hazard	No
Reactive Hazard	No

CWA (Clean Water Act)
This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

CERCLA
This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material

U.S. - Department of Homeland Security - Chemical Facility Anti-Terrorism Standards (CFATS) - Security Issues

Chemical name	U.S. - Department of Homeland Security - Chemical Facility Anti-Terrorism Standards (CFATS) - Security Issues
Sodium dithionite (100%) CAS#: 7775-14-6	Sabotage/Contamination

US State Regulations

California Proposition 65
This product does not contain any Proposition 65 chemicals

IMERC: Not applicable

U.S. State Right-to-Know Regulations

This product may contain substances regulated by state right-to-know regulations.

Chemical name	New Jersey	Massachusetts	Pennsylvania
Sodium dithionite 7775-14-6	X	X	X

U.S. EPA Label Information

Chemical name	FIFRA	FDA
Sodium dithionite	-	21 CFR 182.90

16. OTHER INFORMATION, INCLUDING DATE OF PREPARATION OF THE LAST REVISION

Special Comments
None

Additional information

Global Automotive Declarable Substance List (GADSL)
Not applicable
NFPA and HMIS Classifications

NFPA	**Health hazards** - 2	**Flammability** - 1	**Instability** - 0	**Physical and chemical properties** -
HMIS	**Health hazards** - 2	**Flammability** - 1	**Physical hazards** - 0	**Personal protection** - X

Key or legend to abbreviations and acronyms used in the safety data sheet

NIOSH IDLH	*Immediately Dangerous to Life or Health*
ACGIH	ACGIH (American Conference of Governmental Industrial Hygienists)
NDF	*no data*

Legend - Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
MAC	Maximum Allowable Concentration	Ceiling	Ceiling Limit Value

X	Listed	Vacated	These values have no official status. The only binding levels of contaminants are those listed in the final OSHA PEL. These lists are for reference purposes only. Please note that some reference state regulations of these "liberated" exposure limits in their state regulations.
SKN*	Skin designation	SKN+	Skin sensitization
RSP+	Respiratory sensitization	**	Hazard Designation
C	Carcinogen	R	Reproductive toxicant
M	mutagen		

Prepared By Hach Product Compliance Department

Issue Date 26-Sep-2019

Revision Date 26-Sep-2019

Revision Note None

Disclaimer

End of Safety Data Sheet

SAFETY DATA SHEET

1. IDENTIFICATION

Product identifier

Product Name	pH 7.0 SINGLET

Other means of identification

Product Code(s)	M2770151 (U.S. Product Code M2770151)
Safety data sheet number	M00369

Recommended use of the chemical and restrictions on use

Recommended Use	Laboratory reagent. Buffer.
Uses advised against	Consumer use.
Restrictions on use	For Laboratory Use Only.

Details of the supplier of the safety data sheet

Manufacturer Address
Hach Company P.O.Box 389 Loveland, CO 80539 USA +1(970) 669-3050

Emergency telephone number
+1(303) 623-5716 - 24 Hour Service

2. HAZARDS IDENTIFICATION

Classification

Regulatory Status
This chemical is not considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Not a dangerous substance or mixture according to the Globally Harmonized System (GHS)

Hazards not otherwise classified (HNOC)
Not applicable

Label elements

Signal word
None

Hazard statements
The product contains no substances which at their given concentration, are considered to be hazardous to health

Other Hazards Known
None

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance
Not applicable

Mixture

Chemical Family	Mixture.
Chemical nature	Aqueous alkaline solution.

Chemical name	CAS No.	Percent Range	HMRIC #
Sodium phosphate dibasic	7558-79-4	<1%	-
Magnesium nitrate	10377-60-3	<0.1%	-
3(2H)-Isothiazolone, 5-chloro-2-methyl-	26172-55-4	<0.01%	-
3(2H)-Isothiazolone, 2-methyl-	2682-20-4	<0.01%	-

4. FIRST AID MEASURES

Description of first aid measures

General advice	No hazards which require special first aid measures. Use first aid treatment according to the nature of the injury.
Inhalation	Remove to fresh air.
Eye contact	Rinse thoroughly with plenty of water for at least 15 minutes, lifting lower and upper eyelids. Consult a physician.
Skin contact	Wash skin with soap and water.
Ingestion	Clean mouth with water and drink afterwards plenty of water.

Most important symptoms and effects, both acute and delayed

Symptoms	See Section 11 for additional Toxicological Information.

Indication of any immediate medical attention and special treatment needed

Note to physicians	Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Unsuitable Extinguishing Media	Caution: Use of water spray when fighting fire may be inefficient.
Specific hazards arising from the chemical	No information available.
Hazardous combustion products	This material will not burn.
Special protective equipment for fire-fighters	Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear. Use personal protection equipment.

6. ACCIDENTAL RELEASE MEASURES

U.S. Notice	Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance. Outside of the US, only persons properly qualified according to state or local regulations should respond to a spill involving chemicals.

Personal precautions, protective equipment and emergency procedures

Personal precautions	Ensure adequate ventilation.

Environmental precautions

Environmental precautions	See Section 12 for additional ecological information.

Methods and material for containment and cleaning up

Methods for containment	Prevent further leakage or spillage if safe to do so.
Methods for cleaning up	Pick up and transfer to properly labeled containers.
Prevention of secondary hazards	Clean contaminated objects and areas thoroughly observing environmental regulations.
Reference to other sections	See section 8 for more information. See section 13 for more information.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling	Handle in accordance with good industrial hygiene and safety practice.

Conditions for safe storage, including any incompatibilities

Storage Conditions	Keep containers tightly closed in a dry, cool and well-ventilated place.
Flammability class	Not applicable

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines	This product, as supplied, does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies

Appropriate engineering controls

Engineering Controls	Showers Eyewash stations Ventilation systems.

Individual protection measures, such as personal protective equipment

Respiratory protection	No protective equipment is needed under normal use conditions. If exposure limits are exceeded or irritation is experienced, ventilation and evacuation may be required.
Hand Protection	Wear suitable gloves.
Eye/face protection	Wear safety glasses with side shields (or goggles).

Skin and body protection	No special protective equipment required.
General Hygiene Considerations	Handle in accordance with good industrial hygiene and safety practice.
Environmental exposure controls	Local authorities should be advised if significant spillages cannot be contained. Do not allow into any sewer, on the ground or into any body of water.
Thermal hazards	None under normal processing.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state Liquid

Appearance	clear	**Color**	yellow
Odor	None	**Odor threshold**	Not applicable

Property	Values	Remarks • Method
Molecular weight	Not applicable	
pH	7.3	
Melting point/freezing point	~ 0 °C / 32 °F	
Boiling point / boiling range	~ 100 °C / 212 °F	
Evaporation rate	1 (water = 1)	
Vapor pressure	18.002 mm Hg / 2.4 kPa at 20 °C / 68 °F	
Vapor density (air = 1)	0.62	
Specific gravity (water = 1 / air = 1)	1	
Partition Coefficient (n-octanol/water)	No data available	
Soil Organic Carbon-Water Partition Coefficient	No data available	
Autoignition temperature	No data available	
Decomposition temperature	No data available	
Dynamic viscosity	~ 1 cP (mPa s) at 20 °C / 68 °F	
Kinematic viscosity	~ 1 cSt (mm^2/s) at 20 °C / 68 °F	

Solubility(ies)

Water solubility

Water solubility classification	Water solubility	Water Solubility Temperature
Completely soluble	> 10000 mg/L	25 °C / 77 °F

Solubility in other solvents

Chemical Name	Solubility classification	Solubility	Solubility Temperature
None reported	No information available	No data available	No information available

Other Information

Metal Corrosivity

Steel Corrosion Rate	No data available
Aluminum Corrosion Rate	No data available

Volatile Organic Compounds (VOC) Content

Chemical name	CAS No.	Volatile organic compounds (VOC) content	CAA (Clean Air Act)
Sodium phosphate dibasic	7558-79-4	No data available	-
Magnesium nitrate	10377-60-3	No data available	-
3(2H)-Isothiazolone, 5-chloro-2-methyl-	26172-55-4	No data available	-
3(2H)-Isothiazolone, 2-methyl-	2682-20-4	No data available	-

Explosive properties

Upper explosion limit	Not applicable
Lower explosion limit	Not applicable

Flammable properties

Flash point	No data available

Flammability Limit in Air

Upper flammability limit	No data available
Lower flammability limit	No data available

Oxidizing properties	No data available.
Bulk density	Not applicable

10. STABILITY AND REACTIVITY

Reactivity
Not applicable.

Chemical stability
Stable under normal conditions.

Explosion data
Sensitivity to Mechanical Impact None.
Sensitivity to Static Discharge None.

Possibility of Hazardous Reactions
None under normal processing.

Hazardous polymerization
Hazardous polymerization does not occur.

Conditions to avoid
None known based on information supplied.

Incompatible materials

Strong oxidizing agents, strong acids, and strong bases.

Hazardous Decomposition Products
Carbon monoxide. Carbon dioxide (CO2). Nitrogen oxides (NOx). metal oxides.

11. TOXICOLOGICAL INFORMATION

Information on Likely Routes of Exposure

Product Information

Inhalation	No known effect based on information supplied.
Eye contact	No known effect based on information supplied.
Skin contact	No known effect based on information supplied.
Ingestion	No known effect based on information supplied.
Symptoms	No information available.

Acute toxicity
Based on available data, the classification criteria are not met

Product Acute Toxicity Data
No data available.

Ingredient Acute Toxicity Data
Test data reported below.

Oral Exposure Route

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Magnesium nitrate (<0.1%) CAS#: 10377-60-3	Rat LD_{50}	5440 mg/kg	None reported	None reported	IUCLID (The International Uniform Chemical Information Database)
3(2H)-Isothiazolone, 5-chloro-2-methyl- (<0.01%) CAS#: 26172-55-4	Rat LD_{50}	481 mg/kg	None reported	None reported	IUCLID (The International Uniform Chemical Information Database)

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
3(2H)-Isothiazolone, 2-methyl- (<0.01%) CAS#: 2682-20-4	None reported	None reported	None reported	None reported	No information available

Inhalation (Dust/Mist) Exposure Route

Unknown Acute Toxicity
0% of the mixture consists of ingredient(s) of unknown toxicity.

Acute Toxicity Estimations (ATE)

ATEmix (oral)	No information available
ATEmix (dermal)	No information available
ATEmix (inhalation-dust/mist)	No information available

ATEmix (inhalation-vapor)	No information available
ATEmix (inhalation-gas)	No information available

Skin corrosion/irritation

Based on available data, the classification criteria are not met.

Product Skin Corrosion/Irritation Data

No data available.

Ingredient Skin Corrosion/Irritation Data

Test data reported below.

Chemical name	Test method	Species	Reported dose	Exposure time	Results	Key literature references and sources for data
Sodium phosphate dibasic (<1%) CAS#: 7558-79-4	Standard Draize Test	Rabbit	500 mg	24 hours	Skin irritant	RTECS (Registry of Toxic Effects of Chemical Substances)
Magnesium nitrate (<0.1%) CAS#: 10377-60-3	Standard Draize Test	Rabbit	500 mg	24 hours	Skin irritant	HSDB (Hazardous Substances Data Bank)
3(2H)-Isothiazolone, 5-chloro-2-methyl- (<0.01%) CAS#: 26172-55-4	OECD Test 404: Acute Dermal Corrosion/Irritation	Rabbit	None reported	None reported	Corrosive to skin	OECD 429: Skin Sensitization: Local Lymph Node Assay

Serious eye damage/irritation

Based on available data, the classification criteria are not met.

Product Serious Eye Damage/Eye Irritation Data

No data available.

Ingredient Eye Damage/Eye Irritation Data

Test data reported below.

Chemical name	Test method	Species	Reported dose	Exposure time	Results	Key literature references and sources for data
Sodium phosphate dibasic (<1%) CAS#: 7558-79-4	Standard Draize Test	Rabbit	500 mg	24 hours	Eye irritant	RTECS (Registry of Toxic Effects of Chemical Substances)
Magnesium nitrate (<0.1%) CAS#: 10377-60-3	Standard Draize Test	Rabbit	500 mg	24 hours	Eye irritant	HSDB (Hazardous Substances Data Bank)
3(2H)-Isothiazolone, 5-chloro-2-methyl- (<0.01%) CAS#: 26172-55-4	OECD Test 405: Acute Eye Corrosion/Irritation	Rabbit	None reported	None reported	Eye irritant	ERMA (New Zealands Environmental Risk Management Authority) OECD 429: Skin Sensitization: Local Lymph Node Assay

Respiratory or skin sensitization

Based on available data, the classification criteria are not met.

Product Sensitization Data

No data available.

Ingredient Sensitization Data
Test data reported below.

Skin Sensitization Exposure Route

Chemical name	Test method	Species	Results	Key literature references and sources for data
3(2H)-Isothiazolone, 5-chloro-2-methyl- (<0.01%) CAS#: 26172-55-4	OECD Test No. 406: Skin Sensitization	Guinea pig	Confirmed to be a skin sensitizer	IUCLID (The International Uniform Chemical Information Database)

STOT - single exposure
Based on available data, the classification criteria are not met.

Product Specific Target Organ Toxicity Single Exposure Data
No data available.

Ingredient Specific Target Organ Toxicity Single Exposure Data
No data available.

STOT - repeated exposure
Based on available data, the classification criteria are not met.

Product Specific Target Organ Toxicity Repeat Dose Data
No data available.

Ingredient Specific Target Organ Toxicity Repeat Exposure Data
No data available.

Carcinogenicity
Based on available data, the classification criteria are not met.

Product Carcinogenicity Data
No data available.

Ingredient Carcinogenicity Data
No data available.

Chemical name	CAS No.	ACGIH	IARC	NTP	OSHA
Sodium phosphate dibasic	7558-79-4	-	-	-	-
Magnesium nitrate	10377-60-3	-	Group 2A	-	X
3(2H)-Isothiazolone, 5-chloro-2-methyl-	26172-55-4	-	-	-	-
3(2H)-Isothiazolone, 2-methyl-	2682-20-4	-	-	-	-

Legend

ACGIH (American Conference of Governmental Industrial Hygienists)	Does not apply
IARC (International Agency for Research on Cancer)	Does not apply
NTP (National Toxicology Program)	Does not apply
OSHA (Occupational Safety and Health Administration of the US Department of Labor)	Does not apply

Germ cell mutagenicity
Based on available data, the classification criteria are not met.

Product Germ Cell Mutagenicity *invitro* Data
No data available.

Ingredient Germ Cell Mutagenicity *invitro* **Data**
No data available.

Product Germ Cell Mutagenicity *invivo* **Data**
No data available.

Ingredient Germ Cell Mutagenicity *invivo* **Data**
No data available.

Reproductive toxicity
Based on available data, the classification criteria are not met.

Product Reproductive Toxicity Data
No data available.

Ingredient Reproductive Toxicity Data
No data available.

Aspiration hazard
Based on available data, the classification criteria are not met.

12. ECOLOGICAL INFORMATION

Ecotoxicity	Based on available data, the classification criteria are not met.
Unknown aquatic toxicity	0% of the mixture consists of components(s) of unknown hazards to the aquatic environment.

Product Ecological Data

Aquatic Acute Toxicity
No data available.

Aquatic Chronic Toxicity
No data available.

Ingredient Ecological Data

Aquatic Acute Toxicity
Test data reported below.

Fish

Chemical name	Exposure time	Species	Endpoint type	Reported dose	Key literature references and sources for data
Magnesium nitrate (<0.1%) CAS#: 10377-60-3	96 hours	*Lepomis macrochirus*	LC_{50}	9000 mg/L	ECHA (The European Chemicals Agency)
3(2H)-Isothiazolone, 5-chloro-2-methyl- (<0.01%) CAS#: 26172-55-4	96 hours	*Oncorhynchus mykiss*	LC_{50}	0.19 mg/L	EPA (United States Environmental Protection Agency)
3(2H)-Isothiazolone, 2-methyl- (<0.01%) CAS#: 2682-20-4	96 hours	*Oncorhynchus mykiss*	LC_{50}	0.7 mg/L	EPA (United States Environmental Protection Agency)

Crustacea

Chemical name	Exposure time	Species	Endpoint type	Reported dose	Key literature references and sources for data
Magnesium nitrate (<0.1%) CAS#: 10377-60-3	48 Hours	*Daphnia magna*	EC_{50}	880 mg/L	ECHA (The European Chemicals Agency)
3(2H)-Isothiazolone, 5-chloro-2-methyl- (<0.01%) CAS#: 26172-55-4	48 Hours	None reported	LC_{50}	0.56 mg/L	EPA (United States Environmental Protection Agency)
3(2H)-Isothiazolone, 2-methyl- (<0.01%) CAS#: 2682-20-4	48 Hours	*Daphnia magna*	EC_{50}	0.18 mg/L	EPA (United States Environmental Protection Agency)

Algae

Chemical name	Exposure time	Species	Endpoint type	Reported dose	Key literature references and sources for data
Magnesium nitrate (<0.1%) CAS#: 10377-60-3	72 Hours	*Scenedesmus subspicatus*	EC_{50}	> 100 mg/L	ECHA (The European Chemicals Agency)
3(2H)-Isothiazolone, 5-chloro-2-methyl- (<0.01%) CAS#: 26172-55-4	72 Hours	None reported	EC_{50}	0.021 mg/L	EPA (United States Environmental Protection Agency)

Aquatic Chronic Toxicity
No data available.

Persistence and degradability

Product Biodegradability Data
No data available.

Bioaccumulation

Product Bioaccumulation Data
No data available.

Partition Coefficient (n-octanol/water)	No data available

Mobility

Soil Organic Carbon-Water Partition Coefficient	No data available

Other adverse effects

No information available.

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations. Dispose of waste in accordance with environmental legislation.
Contaminated packaging	Do not reuse empty containers.
US EPA Waste Number	Not applicable

Special instructions for disposal	If permitted by regulation. Open cold water tap completely, slowly pour the material to the drain. Check with local municipal and state authorities and waste contractors for pertinent local information regarding the proper disposal of chemicals.

14. TRANSPORT INFORMATION

DOT	Not regulated
TDG	Not regulated
IATA	Not regulated
IMDG	Not regulated

Additional information
There is a possibility that this product could be contained in a reagent set or kit composed of various compatible dangerous goods.
If the item is not in a reagent set or kit, the classification given above applies.
If the item is part of a reagent set or kit the classification would change to the following:
UN3316 Chemical Kit, Hazard Class 9, Packing Group II or III.
If the item is not regulated, the Chemical Kit classification does not apply.

15. REGULATORY INFORMATION

National Inventories

TSCA	Complies
DSL/NDSL	Complies

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

International Inventories

EINECS/ELINCS	Complies
ENCS	Complies
IECSC	Complies
KECL	Complies
PICCS	Complies
TCSI	Complies
AICS	Complies
NZIoC	Complies

EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances
ENCS - Japan Existing and New Chemical Substances
IECSC - China Inventory of Existing Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances
TCSI - Taiwan Chemical Substances Inventory
AICS - Australian Inventory of Chemical Substances
NZIoC - New Zealand Inventory of Chemicals

US Federal Regulations

SARA 313
Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

Chemical name	SARA 313 - Threshold Values %
Magnesium nitrate (CAS #: 10377-60-3)	1.0

SARA 311/312 Hazard Categories

Acute health hazard	No
Chronic Health Hazard	No
Fire hazard	No
Sudden release of pressure hazard	No
Reactive Hazard	No

CWA (Clean Water Act)

This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

Chemical name	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants	CWA - Hazardous Substances
Sodium phosphate dibasic 7558-79-4	5000 lb	-	-	X

CERCLA

This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material

Chemical name	Hazardous Substances RQs	CERCLA/SARA RQ	Reportable Quantity (RQ)
Sodium phosphate dibasic 7558-79-4	5000 lb	-	RQ 5000 lb final RQ RQ 2270 kg final RQ

US State Regulations

California Proposition 65

This product does not contain any Proposition 65 chemicals

IMERC: Not applicable

U.S. State Right-to-Know Regulations

This product may contain substances regulated by state right-to-know regulations.

Chemical name	New Jersey	Massachusetts	Pennsylvania
Sodium phosphate dibasic 7558-79-4	X	X	X
Magnesium nitrate 10377-60-3	X	X	X

U.S. EPA Label Information

Chemical name	FIFRA	FDA
Sodium phosphate dibasic	180.0910	21 CFR 182.1778,21 CFR 182.6290,21 CFR 182.6778,21 CFR 182.8778
Magnesium nitrate	180.0920	-
3(2H)-Isothiazolone, 5-chloro-2-methyl-	180.0920	-
3(2H)-Isothiazolone, 2-methyl-	180.0920	-

16. OTHER INFORMATION, INCLUDING DATE OF PREPARATION OF THE LAST REVISION

Special Comments

None

Additional information

Global Automotive Declarable Substance List (GADSL)

Chemical name	Global Automotive Declarable Substance List Classifications	Global Automotive Declarable Substance List Thersholds
3(2H)-Isothiazolone, 5-chloro-2-methyl- 26172-55-4	Prohibited Substance (LR)	0 %
3(2H)-Isothiazolone, 2-methyl- 2682-20-4	Declarable Substance (LR) Prohibited Substance (LR)	0 %

NFPA and HMIS Classifications

NFPA	**Health hazards** - 0	**Flammability** - 0	**Instability** - 0	**Physical and chemical properties** -
HMIS	**Health hazards** - 0	**Flammability** - 0	**Physical hazards** - 0	**Personal protection** - X

Key or legend to abbreviations and acronyms used in the safety data sheet

NIOSH IDLH	*Immediately Dangerous to Life or Health*
ACGIH	ACGIH (American Conference of Governmental Industrial Hygienists)
NDF	*no data*

Legend - Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
MAC	Maximum Allowable Concentration	Ceiling	Ceiling Limit Value
X	Listed	Vacated	These values have no official status. The only binding levels of contaminants are those listed in the final OSHA PEL. These lists are for reference purposes only. Please note that some reference state regulations of these "liberated" exposure limits in their state regulations.
SKN*	Skin designation	SKN+	Skin sensitization
RSP+	Respiratory sensitization	**	Hazard Designation
C	Carcinogen	R	Reproductive toxicant
M	mutagen		

Prepared By	Hach Product Compliance Department
Issue Date	14-Oct-2019
Revision Date	29-Oct-2019
Revision Note	None

Disclaimer

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

THE INFORMATION CONTAINED HEREIN IS BASED ON DATA CONSIDERED TO BE ACCURATE. HOWEVER, NO WARRANTY IS EXPRESSED OR IMPLIED REGARDING THE ACCURACY OF THESE DATA OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF.

End of Safety Data Sheet

SAFETY DATA SHEET

Issue Date 30-01-2020 **Revision Date** 10-Aug-2020 **Version** 3.1 **Page** 1 / 13

1. IDENTIFICATION

Product identifier

Product Name	Phenol Reagent

Other means of identification

Product Code(s)	2481569
Safety data sheet number	M00538

Recommended use of the chemical and restrictions on use

Recommended Use	Laboratory reagent. Determination of phenol.
Uses advised against	None.
Restrictions on use	None.

Details of the supplier of the safety data sheet

Manufacturer Address
Hach Company P.O.Box 389 Loveland, CO 80539 USA +1(970) 669-3050

Emergency telephone number
+1(303) 623-5716 - 24 Hour Service

2. HAZARDS IDENTIFICATION

Classification

Regulatory Status
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 2A
Chronic aquatic toxicity	Category 3

Hazards not otherwise classified (HNOC)
Not applicable

Label elements

Signal word
Warning

Hazard statements
H315 - Causes skin irritation
H319 - Causes serious eye irritation
H412 - Harmful to aquatic life with long lasting effects

Precautionary statements
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P332 + P313 - If skin irritation occurs: Get medical attention
P362 - Take off contaminated clothing and wash before reuse
P280 - Wear protective gloves, protective clothing, eye protection, and face protection
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P337 + P313 - If eye irritation persists: Get medical attention
P273 - Avoid release to the environment
P501 - Dispose of contents/ container to an approved waste disposal plant

Other Hazards Known
Harmful to aquatic life

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance
Not applicable

Mixture

Chemical Family Mixture.

Chemical name	CAS No.	Percent Range	HMRIC #
Sodium sulfate	7757-82-6	80 - 90%	-
3H-Pyrazol-3-one, 4-amino-1,2-dihydro-1,5-dimethyl-2-phenyl-, phosphate (1:1)	68258-97-9	10 - 20%	-

4. FIRST AID MEASURES

Description of first aid measures

General advice	Show this safety data sheet to the doctor in attendance.
Inhalation	Remove to fresh air. Get medical attention immediately if symptoms occur.
Eye contact	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Keep eye wide open while rinsing. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if irritation develops and persists. Do not rub affected area.
Skin contact	Wash off immediately with soap and plenty of water for at least 15 minutes. Get medical attention if irritation develops and persists.
Ingestion	Clean mouth with water and drink afterwards plenty of water. Never give anything by mouth to an unconscious person. Do NOT induce vomiting. Call a physician.

Self-protection of the first aider	Avoid contact with skin, eyes or clothing.

Most important symptoms and effects, both acute and delayed

Symptoms	Burning sensation.

Indication of any immediate medical attention and special treatment needed

Note to physicians	Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Unsuitable Extinguishing Media	Caution: Use of water spray when fighting fire may be inefficient.
Specific hazards arising from the chemical	No information available.
Hazardous combustion products	Sodium oxides. Sulfur oxides. Phosphorus oxides. Carbon monoxide, Carbon dioxide. Nitrogen oxides.
Special protective equipment for fire-fighters	Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear. Use personal protection equipment.

6. ACCIDENTAL RELEASE MEASURES

U.S. Notice	Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance. Outside of the US, only persons properly qualified according to state or local regulations should respond to a spill involving chemicals.

Personal precautions, protective equipment and emergency procedures

Personal precautions	Avoid contact with skin, eyes or clothing. Ensure adequate ventilation. Use personal protective equipment as required.
Other Information	Refer to protective measures listed in Sections 7 and 8.

Environmental precautions

Environmental precautions	Prevent further leakage or spillage if safe to do so.

Methods and material for containment and cleaning up

Methods for containment	Prevent further leakage or spillage if safe to do so.
Methods for cleaning up	Pick up and transfer to properly labeled containers.
Prevention of secondary hazards	Clean contaminated objects and areas thoroughly observing environmental regulations.
Reference to other sections	See section 8 for more information. See section 13 for more information.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling	Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes or clothing. Do not eat, drink or smoke when using this product. Take off contaminated clothing and wash before reuse.

Conditions for safe storage, including any incompatibilities

Storage Conditions	Keep containers tightly closed in a dry, cool and well-ventilated place.
Flammability class	Not applicable

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines	This product, as supplied, does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies

Appropriate engineering controls

Engineering Controls	Showers Eyewash stations Ventilation systems.

Individual protection measures, such as personal protective equipment

Respiratory protection	No protective equipment is needed under normal use conditions. If exposure limits are exceeded or irritation is experienced, ventilation and evacuation may be required.
Hand Protection	Wear suitable gloves. Impervious gloves.
Eye/face protection	If splashes are likely to occur, wear safety glasses with side-shields.
Skin and body protection	Wear suitable protective clothing. Long sleeved clothing.
General Hygiene Considerations	Wear suitable gloves and eye/face protection. Do not eat, drink or smoke when using this product. Avoid contact with skin, eyes or clothing.
Environmental exposure controls	Local authorities should be advised if significant spillages cannot be contained. Do not allow into any sewer, on the ground or into any body of water.
Thermal hazards	None under normal processing.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state	Solid		
Appearance	powder	**Color**	Light yellow to orange
Odor	Odorless	**Odor threshold**	No data available

Property	Values	Remarks • Method
Molecular weight	No data available	
pH	No data available	

Melting point/freezing point	No data available
Boiling point / boiling range	No data available
Evaporation rate	Not applicable
Vapor pressure	Not applicable
Vapor density (air = 1)	Not applicable
Specific gravity (water = 1 / air = 1)	1.073
Partition Coefficient (n-octanol/water)	log K_{ow} ~ -2.66
Soil Organic Carbon-Water Partition Coefficient	log K_{oc} ~ -1.07
Autoignition temperature	No data available
Decomposition temperature	No data available
Dynamic viscosity	Not applicable
Kinematic viscosity	Not applicable

Solubility(ies)

Water solubility

Water solubility classification	Water solubility	Water Solubility Temperature
Soluble	> 1000 mg/L	25 °C / 77 °F

Solubility in other solvents

Chemical Name	Solubility classification	Solubility	Solubility Temperature
Acid	Soluble	> 1000 mg/L	25 °C / 77 °F

Other Information

Metal Corrosivity

Steel Corrosion Rate	Not applicable
Aluminum Corrosion Rate	Not applicable

Volatile Organic Compounds (VOC) Content
Not applicable

Chemical name	CAS No.	Volatile organic compounds (VOC) content	CAA (Clean Air Act)
Sodium sulfate	7757-82-6	No data available	-
3H-Pyrazol-3-one, 4-amino-1,2-dihydro-1,5-dimethyl-2-phenyl-, phosphate (1:1)	68258-97-9	No data available	-

Explosive properties

Upper explosion limit	No data available
Lower explosion limit	No data available

Flammable properties

Flash point	Not applicable
Flammability Limit in Air	
Upper flammability limit	No data available
Lower flammability limit	No data available
Oxidizing properties	No data available.
Bulk density	No data available

10. STABILITY AND REACTIVITY

Reactivity
Not applicable.

Chemical stability
Stable under normal conditions.

Explosion data

Sensitivity to Mechanical Impact	None.
Sensitivity to Static Discharge	None.

Possibility of Hazardous Reactions
None under normal processing.

Hazardous polymerization
None under normal processing.

Conditions to avoid
None known based on information supplied.

Incompatible materials
Strong acids. Strong bases. Strong oxidizing agents.

Hazardous Decomposition Products
Sodium oxides. Sulfur oxides. Phosphorus oxides. Carbon dioxide. Carbon monoxide. Nitrogen oxides.

11. TOXICOLOGICAL INFORMATION

Information on Likely Routes of Exposure

Product Information

Inhalation	May cause irritation of respiratory tract.
Eye contact	Irritating to eyes. Causes serious eye irritation.
Skin contact	Causes skin irritation.
Ingestion	Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.
Symptoms	Redness. May cause redness and tearing of the eyes.

Acute toxicity
Based on available data, the classification criteria are not met

Product Acute Toxicity Data

No data available.

Ingredient Acute Toxicity Data
No data available.

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
3H-Pyrazol-3-one, 4-amino-1,2-dihydro-1,5-dimethyl-2-phenyl-, phosphate (1:1) (10 - 20%) CAS#: 68258-97-9	Rat LD_{50}	1700 mg/kg	None reported	None reported	No information available

Unknown Acute Toxicity
0% of the mixture consists of ingredient(s) of unknown toxicity.

Acute Toxicity Estimations (ATE)

The following values are calculated based on chapter 3.1 of the GHS document

ATEmix (oral)	11,486.00 mg/kg
ATEmix (dermal)	No information available
ATEmix (inhalation-dust/mist)	No information available
ATEmix (inhalation-vapor)	No information available
ATEmix (inhalation-gas)	No information available

Skin corrosion/irritation
Classification based on data available for ingredients. Irritating to skin.

Product Skin Corrosion/Irritation Data
No data available.

Ingredient Skin Corrosion/Irritation Data
No data available.

Chemical name	Test method	Species	Reported dose	Exposure time	Results	Key literature references and sources for data
Sodium sulfate (80 - 90%) CAS#: 7757-82-6	Standard Draize Test	Rabbit	500 mg	4 hours	Not corrosive or irritating to skin	ECHA (The European Chemicals Agency)

Serious eye damage/irritation
Classification based on data available for ingredients. Irritating to eyes.

Product Serious Eye Damage/Eye Irritation Data
No data available.

Ingredient Eye Damage/Eye Irritation Data
No data available.

Chemical name	Test method	Species	Reported dose	Exposure time	Results	Key literature references and sources for data
Sodium sulfate (80 - 90%) CAS#: 7757-82-6	Standard Draize Test	Rabbit	90 mg	24 hours	Not corrosive or irritating to eyes	ECHA (The European Chemicals Agency)

Respiratory or skin sensitization
Based on available data, the classification criteria are not met.

Product Sensitization Data
No data available.

Ingredient Sensitization Data
No data available.

Chemical name	Test method	Species	Results	Key literature references and sources for data
Sodium sulfate (80 - 90%) CAS#: 7757-82-6	OECD Test No. 406: Skin Sensitization	Guinea pig	Not confirmed to be a skin sensitizer	HSDB (Hazardous Substances Data Bank)

STOT - single exposure
Based on available data, the classification criteria are not met.

Product Specific Target Organ Toxicity Single Exposure Data
No data available.

Ingredient Specific Target Organ Toxicity Single Exposure Data
No data available.

STOT - repeated exposure
Based on available data, the classification criteria are not met.

Product Specific Target Organ Toxicity Repeat Dose Data
No data available.

Ingredient Specific Target Organ Toxicity Repeat Exposure Data
No data available.

Carcinogenicity
Based on available data, the classification criteria are not met.

Product Carcinogenicity Data
No data available.

Ingredient Carcinogenicity Data
No data available.

Chemical name	CAS No.	ACGIH	IARC	NTP	OSHA
Sodium sulfate	7757-82-6	-	-	-	-
3H-Pyrazol-3-one, 4-amino-1,2-dihydro-1,5-dimethyl-2-phenyl-, phosphate (1:1)	68258-97-9	-	-	-	-

Legend

ACGIH (American Conference of Governmental Industrial Hygienists)	Does not apply
IARC (International Agency for Research on Cancer)	Does not apply
NTP (National Toxicology Program)	Does not apply
OSHA (Occupational Safety and Health Administration of the US Department of Labor)	Does not apply

Germ cell mutagenicity
Based on available data, the classification criteria are not met.

Product Germ Cell Mutagenicity *invitro* Data
No data available.

Ingredient Germ Cell Mutagenicity *invitro* Data

No data available.

Chemical name	Test	Cell Strain	Reported dose	Exposure time	Results	Key literature references and sources for data
3H-Pyrazol-3-one, 4-amino-1,2-dihydro-1,5-dimethyl-2-phenyl-, phosphate (1:1) (10 - 20%) CAS#: 68258-97-9	Mutation in microorganisms	*Salmonella typhimurium*	0.005 mmol/plate	None reported	Positive test result for mutagenicity	HSDB (Hazardous Substances Data Bank)

Product Germ Cell Mutagenicity *invivo* Data
No data available.

Ingredient Germ Cell Mutagenicity *invivo* Data
No data available.

Reproductive toxicity
Based on available data, the classification criteria are not met.

Product Reproductive Toxicity Data
No data available.

Ingredient Reproductive Toxicity Data
No data available.

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Sodium sulfate (80 - 90%) CAS#: 7757-82-6	Mouse TD_{Lo}	14000 mg/kg	4 days	**Effects on Newborn** Other neonatal measures or effects	RTECS (Registry of Toxic Effects of Chemical Substances)

Aspiration hazard
Based on available data, the classification criteria are not met.

12. ECOLOGICAL INFORMATION

Ecotoxicity Harmful to aquatic life with long lasting effects.

Unknown aquatic toxicity 0% of the mixture consists of components(s) of unknown hazards to the aquatic environment.

Product Ecological Data

Aquatic Acute Toxicity
No data available.

Aquatic Chronic Toxicity
No data available.

Ingredient Ecological Data

Aquatic Acute Toxicity
No data available.

Chemical name	Exposure time	Species	Endpoint type	Reported dose	Key literature references and sources for data
Sodium sulfate (80 - 90%) CAS#: 7757-82-6	96 hours	None reported	LC_{50}	56 mg/L	IUCLID (The International Uniform Chemical Information Database)
3H-Pyrazol-3-one,	96 hours	None reported	LC_{50}	10.806 mg/L	Estimation through ECOSARS

4-amino-1,2-dihydro-1,5-dimethyl-2-phenyl-, phosphate (1:1) (10 - 20%) CAS#: 68258-97-9					v1.11 part of the Estimation Programs Interface (EPI) Suite™

Chemical name	Exposure time	Species	Endpoint type	Reported dose	Key literature references and sources for data
Sodium sulfate (80 - 90%) CAS#: 7757-82-6	48 Hours	*Daphnia magna*	EC_{50}	3150 mg/L	IUCLID (The International Uniform Chemical Information Database)
3H-Pyrazol-3-one, 4-amino-1,2-dihydro-1,5-dimethyl-2-phenyl-, phosphate (1:1) (10 - 20%) CAS#: 68258-97-9	48 Hours	None reported	LC_{50}	80.899 mg/L	Estimation through ECOSARS v1.11 part of the Estimation Programs Interface (EPI) Suite™

Chemical name	Exposure time	Species	Endpoint type	Reported dose	Key literature references and sources for data
3H-Pyrazol-3-one, 4-amino-1,2-dihydro-1,5-dimethyl-2-phenyl-, phosphate (1:1) (10 - 20%) CAS#: 68258-97-9	96 hours	None reported	EC_{50}	2.357 mg/L	Estimation through ECOSARS v1.11 part of the Estimation Programs Interface (EPI) Suite™

Aquatic Chronic Toxicity
No data available.

Persistence and degradability

Product Biodegradability Data
No data available.

Bioaccumulation

Product Bioaccumulation Data
No data available.

Partition Coefficient (n-octanol/water)	log K_{ow} ~ -2.66

Mobility

Soil Organic Carbon-Water Partition Coefficient	log K_{oc} ~ -1.07

Other adverse effects
No information available.

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations. Dispose of waste in accordance with environmental legislation.
Contaminated packaging	Do not reuse empty containers.
Special instructions for disposal	Dilute material with excess water making a weaker than 5% solution. Adjust to a pH between 6 and 9 with an alkali, such as soda ash or sodium bicarbonate. If permitted by

regulation. Open cold water tap completely, slowly pour the reacted material to the drain. Check with local municipal and state authorities and waste contractors for pertinent local information regarding the proper disposal of chemicals.

14. TRANSPORT INFORMATION

DOT	Not regulated
TDG	Not regulated
IATA	Not regulated
IMDG	Not regulated
Note:	No special precautions necessary.

Additional information
There is a possibility that this product could be contained in a reagent set or kit composed of various compatible dangerous goods.
If the item is not in a reagent set or kit, the classification given above applies.
If the item is part of a reagent set or kit the classification would change to the following:
UN3316 Chemical Kit, Hazard Class 9, Packing Group II or III.
If the item is not regulated, the Chemical Kit classification does not apply.

15. REGULATORY INFORMATION

National Inventories

TSCA	Complies
DSL/NDSL	Complies

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

International Inventories

EINECS/ELINCS	Complies
ENCS	Does not comply
IECSC	Does not comply
Existing substances	Complies
PICCS	Does not comply
TCSI	Complies
AICS	Complies
NZIoC	Does not comply

EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances
ENCS - Japan Existing and New Chemical Substances
IECSC - China Inventory of Existing Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances
TCSI - Taiwan Chemical Substances Inventory
AICS - Australian Inventory of Chemical Substances
NZIoC - New Zealand Inventory of Chemicals

US Federal Regulations

SARA 313
Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

SARA 311/312 Hazard Categories

Acute health hazard	Yes
Chronic Health Hazard	No

Fire hazard	No
Sudden release of pressure hazard	No
Reactive Hazard	No

CWA (Clean Water Act)
This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

CERCLA
This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material

US State Regulations

California Proposition 65
This product does not contain any Proposition 65 chemicals

U.S. State Right-to-Know Regulations

This product does not contain any substances regulated by state right-to-know regulations.

Chemical name	New Jersey	Massachusetts	Pennsylvania
Sodium sulfate 7757-82-6	-	X	X

U.S. EPA Label Information

Chemical name	FIFRA	FDA
Sodium sulfate	-	21 CFR 186.1797

16. OTHER INFORMATION, INCLUDING DATE OF PREPARATION OF THE LAST REVISION

Special Comments
None

Additional information

Global Automotive Declarable Substance List (GADSL)
Not applicable

NFPA and HMIS Classifications

NFPA	**Health hazards** - 2	**Flammability** - 0	**Instability** - 0	**Physical and chemical properties** -
HMIS	**Health hazards** - 2	**Flammability** - 0	**Physical hazards** - 0	**Personal protection** - X

Key or legend to abbreviations and acronyms used in the safety data sheet

NIOSH IDLH	*Immediately Dangerous to Life or Health*
ACGIH	ACGIH (American Conference of Governmental Industrial Hygienists)
NDF	*no data*

Legend - Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)

MAC	Maximum Allowable Concentration	Ceiling	Ceiling Limit Value
X	Listed	Vacated	These values have no official status. The only binding levels of contaminants are those listed in the final OSHA PEL. These lists are for reference purposes only. Please note that some reference state regulations of these "liberated" exposure limits in their state regulations.
SKN*	Skin designation	SKN+	Skin sensitization
RSP+	Respiratory sensitization	**	Hazard Designation
C	Carcinogen	R	Reproductive toxicant
M	mutagen		

Prepared By	Hach Product Compliance Department
Issue Date	30-01-2020
Revision Date	10-Aug-2020
Revision Note	None

Disclaimer

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

THE INFORMATION CONTAINED HEREIN IS BASED ON DATA CONSIDERED TO BE ACCURATE. HOWEVER, NO WARRANTY IS EXPRESSED OR IMPLIED REGARDING THE ACCURACY OF THESE DATA OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF.

End of Safety Data Sheet

SAFETY DATA SHEET

1. IDENTIFICATION

Product identifier

Product Name	Potassium Persulfate

Other means of identification

Product Code(s)	2084769
Safety data sheet number	M00039
UN/ID no	UN1492

Recommended use of the chemical and restrictions on use

Recommended Use	Analytical reagent.
Uses advised against	Consumer use.
Restrictions on use	For Laboratory Use Only.

Details of the supplier of the safety data sheet

Manufacturer Address
Hach Company P.O.Box 389 Loveland, CO 80539 USA +1(970) 669-3050

Emergency telephone number
+1(303) 623-5716 - 24 Hour Service

2. HAZARDS IDENTIFICATION

Classification

Regulatory Status
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Oxidizing solids	Category 3
Acute toxicity - Oral	Category 4
Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 2A
Respiratory sensitization	Category 1
Skin sensitization	Category 1
Specific target organ toxicity (single exposure)	Category 3

Hazards not otherwise classified (HNOC)
Not applicable

Label elements

Signal word
Danger

Hazard statements
H272 - May intensify fire; oxidizer
H302 - Harmful if swallowed
H315 - Causes skin irritation
H317 - May cause an allergic skin reaction
H319 - Causes serious eye irritation
H334 - May cause allergy or asthma symptoms or breathing difficulties if inhaled
H335 - May cause respiratory irritation

Precautionary statements
P270 - Do not eat, drink or smoke when using this product
P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
P330 - Rinse mouth
P501 - Dispose of contents/ container to an approved waste disposal plant
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P362 - Take off contaminated clothing and wash before reuse
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P337 + P313 - If eye irritation persists: Get medical advice/attention
P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
P285 - In case of inadequate ventilation wear respiratory protection
P304 + P341 - IF INHALED: If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing
P342 + P311 - If experiencing respiratory symptoms: Call a POISON CENTER or doctor/physician
P272 - Contaminated work clothing should not be allowed out of the workplace
P333 + P313 - If skin irritation or rash occurs: Get medical advice/attention
P363 - Wash contaminated clothing before reuse
P271 - Use only outdoors or in a well-ventilated area
P304 + P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing
P312 - Call a POISON CENTER or doctor if you feel unwell
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P405 - Store locked up
P210 - Keep away from heat/sparks/open flames/hot surfaces. - No smoking
P220 - Keep/Store away from clothing/ combustible materials
P221 - Take any precaution to avoid mixing with combustibles
P370 + P378 - In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish

Other Hazards Known
Harmful to aquatic life

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance

Chemical Name	Potassium persulfate

Chemical Family	Oxidizing Agents.
Formula	$K_2S_2O_8$
CAS No	7727-21-1
Chemical nature	Inorganic Compound.

Percent ranges are used where confidential product information is applicable.

Chemical name	CAS No.	Percent Range	HMRIC #
Potassium persulfate	7727-21-1	100%	-

4. FIRST AID MEASURES

Description of first aid measures

General advice	Show this safety data sheet to the doctor in attendance.
Inhalation	May cause allergic respiratory reaction. If breathing has stopped, give artificial respiration. Get medical attention immediately. Remove to fresh air. Avoid direct contact with skin. Use barrier to give mouth-to-mouth resuscitation. Get immediate medical advice/attention.
Eye contact	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Keep eye wide open while rinsing. Do not rub affected area. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if irritation develops and persists.
Skin contact	IF ON CLOTHING: rinse immediately contaminated clothing and skin with plenty of water before removing clothes. IF ON SKIN: Wash with plenty of soap and water. Wash contaminated clothing before reuse. May cause an allergic skin reaction. In the case of skin irritation or allergic reactions see a physician. Wash off immediately with soap and plenty of water for at least 15 minutes.
Ingestion	Do NOT induce vomiting. Clean mouth with water and drink afterwards plenty of water. Never give anything by mouth to an unconscious person. May produce an allergic reaction. Get immediate medical advice/attention.
Self-protection of the first aider	Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination. Avoid contact with skin, eyes or clothing. Avoid direct contact with skin. Use barrier to give mouth-to-mouth resuscitation.

Most important symptoms and effects, both acute and delayed

Symptoms	May cause allergy or asthma symptoms or breathing difficulties if inhaled. Coughing and/ or wheezing. Itching. Rashes. Hives. Burning sensation.

Indication of any immediate medical attention and special treatment needed

Note to physicians	May cause sensitization in susceptible persons. Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media	Use water. Do not use dry chemicals or foams. CO_2 or Halon may provide limited control. Flood fire area with water from a distance. Move containers from fire area if you can do it without risk. Cool containers with flooding quantities of water until well after fire is out.
Unsuitable Extinguishing Media	Dry chemical. Foam. Caution: Use of water spray when fighting fire may be inefficient.
Specific hazards arising from the chemical	These substances will accelerate burning when involved in a fire. Some may decompose explosively when heated or involved in a fire. May ignite combustibles (wood paper, oil,

	clothing, etc.). Runoff may create fire or explosion hazard. Product is or contains a sensitizer. May cause sensitization by inhalation and skin contact. May cause sensitization by skin contact.
Hazardous combustion products	Thermal decomposition can lead to release of irritating and toxic gases and vapors. Sulfur oxides. Potassium oxides.
Special protective equipment for fire-fighters	Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear. Use personal protection equipment. Do not move cargo or vehicle if cargo has been exposed to heat. Oxidizer. May ignite combustibles (wood paper, oil, clothing, etc.). Move containers from fire area if you can do it without risk. Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. ALWAYS stay away from tanks engulfed in fire. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible withdraw from area and let fire burn.

6. ACCIDENTAL RELEASE MEASURES

U.S. Notice	Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance. Outside of the US, only persons properly qualified according to state or local regulations should respond to a spill involving chemicals.

Personal precautions, protective equipment and emergency procedures

Personal precautions	Ensure adequate ventilation. Avoid contact with skin, eyes or clothing. Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. See section 8 for more information. Stop leak if you can do it without risk. Use personal protective equipment as required.
Other Information	Keep combustibles (wood, paper, oil, etc) away from spilled material. DO NOT GET WATER INSIDE CONTAINERS. Ventilate the area. Refer to protective measures listed in Sections 7 and 8.

Environmental precautions

Environmental precautions	Prevent entry into waterways, sewers, basements or confined areas. Do not flush into surface water or sanitary sewer system. Prevent further leakage or spillage if safe to do so. Prevent product from entering drains.

Methods and material for containment and cleaning up

Methods for containment	Stop leak if you can do it without risk. Cover with DRY earth, DRY sand or other non-combustible material followed with plastic sheet to minimize spreading or contact with rain.
Methods for cleaning up	With clean shovel place material into clean, dry container and cover loosely; move containers from spill area. Flush area with flooding quantities of water. Prevent product from entering drains. Cover powder spill with plastic sheet or tarp to minimize spreading and keep powder dry.
Prevention of secondary hazards	Clean contaminated objects and areas thoroughly observing environmental regulations.
Reference to other sections	See section 8 for more information. See section 13 for more information.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling Use personal protection equipment. Avoid contact with skin, eyes or clothing. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Do not eat, drink or smoke when using this product. Remove contaminated clothing and shoes. Use with local exhaust ventilation. Handle in accordance with good industrial hygiene and safety practice. Provide extract ventilation to points where emissions occur. In case of insufficient ventilation, wear suitable respiratory equipment. Take off contaminated clothing and wash before reuse. Avoid breathing vapors or mists.

Conditions for safe storage, including any incompatibilities

Storage Conditions Keep containers tightly closed in a dry, cool and well-ventilated place. Keep in properly labeled containers. Do not store near combustible materials. Keep out of the reach of children. Store locked up. Store in accordance with particular national and local regulations.

Flammability class Not applicable

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines

Chemical name	ACGIH TLV	OSHA PEL	NIOSH
Potassium persulfate CAS#: 7727-21-1	TWA: 0.1 mg/m^3 persulfate	NDF	NDF

Appropriate engineering controls

Engineering Controls Showers
Eyewash stations
Ventilation systems.

Individual protection measures, such as personal protective equipment

Respiratory protection No protective equipment is needed under normal use conditions. If exposure limits are exceeded or irritation is experienced, ventilation and evacuation may be required.

Hand Protection Wear suitable gloves. Impervious gloves.

Eye/face protection Tight sealing safety goggles.

Skin and body protection Wear suitable protective clothing. Long sleeved clothing. Chemical resistant apron. Wear fire/flame resistant/retardant clothing.

General Hygiene Considerations Do not eat, drink or smoke when using this product. Remove and wash contaminated clothing and gloves, including the inside, before re-use. Contaminated work clothing should not be allowed out of the workplace. Regular cleaning of equipment, work area and clothing is recommended. Wash hands before breaks and immediately after handling the product. Avoid contact with skin, eyes or clothing. Wear suitable gloves and eye/face protection.

Environmental exposure controls Local authorities should be advised if significant spillages cannot be contained. Do not allow into any sewer, on the ground or into any body of water.

Thermal hazards None under normal processing.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state	Solid		
Appearance	crystalline	**Color**	white
Odor	Odorless	**Odor threshold**	Not applicable

Property	Values	Remarks • Method
Molecular weight	270.32 g/mole	
pH	4.0	5.0% Solution
Melting point/freezing point	>= 170 °C / 338 °F	
Boiling point / boiling range	No data available	
Evaporation rate	Not applicable	
Vapor pressure	Not applicable	
Vapor density (air = 1)	Not applicable	
Specific gravity (water = 1 / air = 1)	2.477	
Partition Coefficient (n-octanol/water)	No data available	
Soil Organic Carbon-Water Partition Coefficient	No data available	
Autoignition temperature	No data available	
Decomposition temperature	170 °C / 338 °F	
Dynamic viscosity	Not applicable	
Kinematic viscosity	Not applicable	

Solubility(ies)

Water solubility

Water solubility classification	Water solubility	Water Solubility Temperature
Completely soluble	47000 mg/L	25 °C / 77 °F

Solubility in other solvents

Chemical Name	Solubility classification	Solubility	Solubility Temperature
None reported	No information available	No data available	No information available

Other Information

Metal Corrosivity

Steel Corrosion Rate	Not applicable
Aluminum Corrosion Rate	Not applicable

Volatile Organic Compounds (VOC) Content
This Product is by Weight 100% an Individual Pure Chemical Substance

Chemical name	CAS No.	Volatile organic compounds (VOC) content	CAA (Clean Air Act)
Potassium persulfate	7727-21-1	Not applicable	-

Explosive properties

Upper explosion limit	No data available
Lower explosion limit	No data available

Flammable properties

Flash point	Not applicable

Flammability Limit in Air

Upper flammability limit	No data available
Lower flammability limit	No data available
Oxidizing properties	Classified as an oxidizer according to GHS criteria.
Bulk density	1150 kg/m^3

10. STABILITY AND REACTIVITY

Reactivity
Oxidizer.

Chemical stability
May cause fire or explosion; strong oxidizer.

Explosion data

Sensitivity to Mechanical Impact	None.
Sensitivity to Static Discharge	Yes.

Possibility of Hazardous Reactions
None under normal processing.

Hazardous polymerization
Hazardous polymerization does not occur.

Conditions to avoid
Heat, flames and sparks. Incompatible materials.

Incompatible materials
organic material. Combustible material. Hydrocarbons. Strong acids. Strong bases. Strong oxidizing agents.

Hazardous Decomposition Products
Sulfur oxides.

11. TOXICOLOGICAL INFORMATION

Information on Likely Routes of Exposure

Product Information

Inhalation	May cause sensitization in susceptible persons. May cause irritation of respiratory tract.

Eye contact	Irritating to eyes. Causes serious eye irritation.
Skin contact	Repeated or prolonged skin contact may cause allergic reactions with susceptible persons. May cause sensitization by skin contact. Causes skin irritation.
Ingestion	May cause additional affects as listed under "Inhalation". Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. Harmful if swallowed.
Symptoms	Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain, or flushing. Coughing and/ or wheezing. Itching. Rashes. Hives. Redness. May cause redness and tearing of the eyes.

Acute toxicity
Harmful if swallowed

Product Acute Toxicity Data
If available, see ingredient data below.

Ingredient Acute Toxicity Data
Test data reported below.

Oral Exposure Route

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Potassium persulfate (100%) CAS#: 7727-21-1	Rat LD_{50}	802 mg/kg	None reported	None reported	IUCLID (The International Uniform Chemical Information Database)

Unknown Acute Toxicity
0% of the mixture consists of ingredient(s) of unknown toxicity.

Acute Toxicity Estimations (ATE)
Not applicable
The following values are calculated based on chapter 3.1 of the GHS document

ATEmix (oral)	No information available
ATEmix (dermal)	No information available
ATEmix (inhalation-dust/mist)	No information available
ATEmix (inhalation-vapor)	No information available
ATEmix (inhalation-gas)	No information available

Skin corrosion/irritation
Classification based on data available for ingredients. Irritating to skin.

Product Skin Corrosion/Irritation Data
If available, see ingredient data below.

Ingredient Skin Corrosion/Irritation Data
No data available.

Serious eye damage/irritation
Classification based on data available for ingredients. Irritating to eyes.

Product Serious Eye Damage/Eye Irritation Data
If available, see ingredient data below.

Ingredient Eye Damage/Eye Irritation Data

No data available.

Respiratory or skin sensitization

May cause sensitization by inhalation. May cause sensitization by skin contact.

Product Sensitization Data

If available, see ingredient data below.

Ingredient Sensitization Data

Test data reported below.

Skin Sensitization Exposure Route

Chemical name	Test method	Species	Results	Key literature references and sources for data
Potassium persulfate (100%) CAS#: 7727-21-1	Local Lymph Node Assay	Mouse	Confirmed to be a skin sensitizer	ECHA (The European Chemicals Agency)

STOT - single exposure

May cause respiratory irritation.

Product Specific Target Organ Toxicity Single Exposure Data

If available, see ingredient data below.

Ingredient Specific Target Organ Toxicity Single Exposure Data

No data available.

STOT - repeated exposure

Based on available data, the classification criteria are not met.

Product Specific Target Organ Toxicity Repeat Dose Data

If available, see ingredient data below.

Ingredient Specific Target Organ Toxicity Repeat Exposure Data

Test data reported below.

Oral Exposure Route

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Potassium persulfate (100%) CAS#: 7727-21-1	Rat NOAEL	131.5 mg/kg	28 days	No toxicological effects observed	ECHA (The European Chemicals Agency)

Dermal Exposure Route

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Potassium persulfate (100%) CAS#: 7727-21-1	Rat NOAEL	91 mg/kg	90 days	No toxicological effects observed	ECHA (The European Chemicals Agency)

Inhalation (Dust/Mist) Exposure Route

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Potassium persulfate (100%) CAS#: 7727-21-1	Rat NOAEC	10.3 mg/m^3	90 days	No toxicological effects observed	ECHA (The European Chemicals Agency)

Carcinogenicity

Based on available data, the classification criteria are not met.

Product Carcinogenicity Data
If available, see ingredient data below.

Ingredient Carcinogenicity Data
No data available.

Chemical name	CAS No.	ACGIH	IARC	NTP	OSHA
Potassium persulfate	7727-21-1	-	-	-	-

Legend

ACGIH (American Conference of Governmental Industrial Hygienists)	Does not apply
IARC (International Agency for Research on Cancer)	Does not apply
NTP (National Toxicology Program)	Does not apply
OSHA (Occupational Safety and Health Administration of the US Department of Labor)	Does not apply

Germ cell mutagenicity

Based on available data, the classification criteria are not met.

Product Germ Cell Mutagenicity *invitro* **Data**
If available, see ingredient data below.

Ingredient Germ Cell Mutagenicity *invitro* **Data**
Test data reported below.

Chemical name	Test	Cell Strain	Reported dose	Exposure time	Results	Key literature references and sources for data
Potassium persulfate (100%) CAS#: 7727-21-1	Mutation in microorganisms	*Salmonella typhimurium*	10 mg/plate	None reported	Negative test result for mutagenicity	ECHA (The European Chemicals Agency)

Product Germ Cell Mutagenicity *invivo* **Data**
If available, see ingredient data below.

Ingredient Germ Cell Mutagenicity *invivo* **Data**
No data available.

Reproductive toxicity

Based on available data, the classification criteria are not met.

Product Reproductive Toxicity Data
No data available.

Ingredient Reproductive Toxicity Data
Test data reported below.

Oral Exposure Route

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Potassium persulfate (100%) CAS#: 7727-21-1	Rat NOAEL	>= 250 mg/kg	Single generation	No reproductive or developmental toxic effects observed	ECHA (The European Chemicals Agency)

Aspiration hazard
Based on available data, the classification criteria are not met.

12. ECOLOGICAL INFORMATION

Ecotoxicity	Based on available data, the classification criteria are not met.
Unknown aquatic toxicity	0% of the mixture consists of components(s) of unknown hazards to the aquatic environment.

Product Ecological Data

Aquatic Acute Toxicity
If available, see ingredient data below.

Aquatic Chronic Toxicity
If available, see ingredient data below.

Ingredient Ecological Data

Aquatic Acute Toxicity
Test data reported below.

Fish

Chemical name	Exposure time	Species	Endpoint type	Reported dose	Key literature references and sources for data
Potassium persulfate (100%) CAS#: 7727-21-1	96 hours	None reported	LC_{50}	>= 76.3 mg/L	FIFRA

Crustacea

Chemical name	Exposure time	Species	Endpoint type	Reported dose	Key literature references and sources for data
Potassium persulfate (100%) CAS#: 7727-21-1	48 Hours	*Daphnia magna*	EC_{50}	92 mg/L	EPA (United States Environmental Protection Agency)

Aquatic Chronic Toxicity
No data available.

Persistence and degradability

Product Biodegradability Data
No data available.

Bioaccumulation

Product Bioaccumulation Data
No data available.

Partition Coefficient (n-octanol/water)	No data available

Mobility

Soil Organic Carbon-Water Partition Coefficient	No data available

Other adverse effects
No information available.

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Waste from residues/unused products	Should not be released into the environment. Dispose of in accordance with local regulations. Dispose of waste in accordance with environmental legislation.
Contaminated packaging	Do not reuse empty containers.
US EPA Waste Number	D001

14. TRANSPORT INFORMATION

DOT

UN/ID no	UN1492
Proper shipping name	Potassium persulfate
Hazard Class	5.1
Packing Group	III
Description	UN1492, Potassium persulfate, 5.1, III
Emergency Response Guide Number	140

TDG

UN/ID no	UN1492
Proper shipping name	Potassium persulfate
Hazard Class	5.1
Packing Group	III
Description	UN1492, Potassium persulfate, 5.1, III

IATA

UN/ID no	UN1492
Proper shipping name	Potassium persulphate
Hazard Class	5.1
Packing Group	III
ERG Code	5L
Special precautions for user	A803

IMDG

UN/ID no	UN1492
Proper shipping name	Potassium persulphate
Hazard Class	5.1
Packing Group	III
EmS-No	F-A, S-Q

Note: No special precautions necessary.

Additional information
There is a possibility that this product could be contained in a reagent set or kit composed of various compatible dangerous goods.
If the item is not in a reagent set or kit, the classification given above applies.
If the item is part of a reagent set or kit the classification would change to the following:
UN3316 Chemical Kit, Hazard Class 9, Packing Group II or III.
If the item is not regulated, the Chemical Kit classification does not apply.

15. REGULATORY INFORMATION

National Inventories

TSCA	Complies
DSL/NDSL	Complies

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

International Inventories

EINECS/ELINCS	Complies
ENCS	Complies
IECSC	Complies
KECL	Complies
PICCS	Complies
TCSI	Complies
AICS	Complies
NZIoC	Complies

EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances
ENCS - Japan Existing and New Chemical Substances
IECSC - China Inventory of Existing Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances
TCSI - Taiwan Chemical Substances Inventory
AICS - Australian Inventory of Chemical Substances
NZIoC - New Zealand Inventory of Chemicals

US Federal Regulations

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

SARA 311/312 Hazard Categories

Acute health hazard	Yes
Chronic Health Hazard	No
Fire hazard	No
Sudden release of pressure hazard	No
Reactive Hazard	No

CWA (Clean Water Act)

This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

CERCLA

This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material

US State Regulations

California Proposition 65

This product does not contain any Proposition 65 chemicals

IMERC: Not applicable

U.S. State Right-to-Know Regulations

This product may contain substances regulated by state right-to-know regulations.

Chemical name	New Jersey	Massachusetts	Pennsylvania
Potassium persulfate 7727-21-1	X	X	X

U.S. EPA Label Information

16. OTHER INFORMATION, INCLUDING DATE OF PREPARATION OF THE LAST REVISION

Special Comments

None

Additional information

Global Automotive Declarable Substance List (GADSL)
Not applicable

NFPA and HMIS Classifications

NFPA	**Health hazards** - 2	**Flammability** - 0	**Instability** - 1	**Physical and chemical properties** OX
HMIS	**Health hazards** - 2 - *	**Flammability** - 0	**Physical hazards** - 1	**Personal protection** - X

Key or legend to abbreviations and acronyms used in the safety data sheet

NIOSH IDLH	*Immediately Dangerous to Life or Health*
ACGIH	ACGIH (American Conference of Governmental Industrial Hygienists)
NDF	*no data*

Legend - Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
MAC	Maximum Allowable Concentration	Ceiling	Ceiling Limit Value
X	Listed	Vacated	These values have no official status. The only binding levels of contaminants are those listed in the final OSHA PEL. These lists are for reference purposes only. Please note that some reference state regulations of these "liberated" exposure limits in their state regulations.
SKN*	Skin designation	SKN+	Skin sensitization
RSP+	Respiratory sensitization	**	Hazard Designation
C	Carcinogen	R	Reproductive toxicant
M	mutagen		

Prepared By	Hach Product Compliance Department
Issue Date	15-May-2019
Revision Date	15-May-2019
Revision Note	SDS sections updated 2

Disclaimer

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site

safety programs in accordance with applicable hazard communication standards and regulations.

THE INFORMATION CONTAINED HEREIN IS BASED ON DATA CONSIDERED TO BE ACCURATE. HOWEVER, NO WARRANTY IS EXPRESSED OR IMPLIED REGARDING THE ACCURACY OF THESE DATA OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF.

End of Safety Data Sheet

Attachment F-3

Data Logger Download Field Form

This page intentionally left blank.

Station ID:	**Date:**	**Start Time:**	**End Time:**	**GPS - Lat:**
Team:		**Site Observer:**		**GPS - Long:**
Photos:	**Camera:**	**Air (ºC):**	**Wind:**	**Precip:**
HYDROLOGY	**SAMPLER:**	**Type of flow**	**Laminar** **Turbulent**	**Other:**
Flow (Wade) (Ice) **Method:** (Boat) (Salt)	IQ Measurement description and constraints: **Control:** (Channel) / (Section / (Both)			

DATA LOGGER

Depth of water at data logger (ft):		**Comments pertinent to data loggers:**
Device used to download:		
Time data loggers removed from rope wire:		
Water Level data logger SN:		
Barotroll data logger SN:		
Water Level log filename downloaded:		
Time Water Level log file stopped:		
Time Water Level log file downloaded:		
Barotroll log filename downloaded:		
Time Barotroll log filename downloaded:		
Time Barotroll log filename downloaded:		
NEW Water Level log file started:		
Time Water Level log file started:		
NEW Barotroll log file started:		
Time Barotroll log file started:		

Sketch, Notes and Remarks

Hydrology level 1 review	Name:		Date:	

Appendix G

Maintenance and Calibration of Equipment

Table of Contents

1.0 Introduction

A YSI 556 field meter, YSI 600 OMS V2 meter, or equivalent will be used to measure the following parameters: specific conductance, temperature, pH, and dissolved oxygen (DO). A Hach 2100P will be used to measure turbidity. A Hach® pH Pocket Pro or equivalent will be used to measure pH. The procedure for collecting field measurements is described in Appendix F. Maintenance, decontamination, and calibration of the meters are described below.

2.0 Equipment Maintenance

Maintenance for rented field meters will be performed in Anchorage by the rental company (typically by TTT Environmental [TTT]). The Municipality of Anchorage (MOA) Quality Assurance (QA) Officer, the Contractor QA Officer, or their delegates, will perform maintenance on any MOA- or Contractor-owned equipment in accordance with the manufacturer's directions. Maintenance for the Hach 2100P includes cleaning, battery replacement, and lamp replacement, when necessary. Maintenance for the YSI 556 or equivalent and YSI 600 OMS V2 sonde includes cleaning of sensors and replacement of the DO membrane (for the YSI 556) and other sensors when necessary. Complete descriptions of these procedures can be found in the instrument manuals, which are kept with the instruments. If the maintenance and troubleshooting procedures in the instrument manuals are insufficient, the instruments will be sent to their respective manufacturers for repair.

2.1. YSI 600 OMS V2 Meter

The YSI 600 OMS V2 sonde is a battery-powered device that can be set to collect data and then disconnected from the read-out device or computer for deployment in the field. Battery installation instructions are included in the sonde manual.

A field connector cable and adapter are necessary to set up and calibrate the sonde, see real time readings, and upload files to a computer or a hand-held 650 MDS display. The field connector cable also includes a strain relief cable that should be connected to the bail wire attached to the sonde to ease pressure on the electronic connection. A separate laboratory calibration cable can also be used to connect the sonde to a computer. The initial set-up and launching of the sonde requires that EcoWatch for Windows software is installed on the operating computer.

While the sonde is connected to a computer for set-up, many features can be adjusted. While connected you can activate or deactivate sensors, calibrate the sensors (must be activated), select the read-out language, set the date and time, select which parameters will appear on output reports, view real-time read-outs (sensor must be activated), and select display units (i.e., °F, °C or K). Complete set-up instructions are included in the sonde manual.

The sonde can be set to collect discrete samples or unattended samples. Unattended sampling will be used for long-term deployment of the sonde. While connected to the operating computer the following items can be viewed or adjusted: sample collection interval, start date, start time, duration of sample collection, file name, site description, battery life (in days), and free memory (in days). Battery life and memory are dependent upon the sample collection frequency. The sonde manual provides detailed launching instructions. Downloading data files follows the similar steps as set-up and launching the sonde. Battery life should be checked before the sonde is launched each time the sonde is downloaded.

3.0 Equipment Calibration

Rental instruments will be calibrated as described in the Monitoring, Evaluation, and Quality Assurance Plan (QAP) by the rental agency and records provided to the Contractor. MOA- or Contractor-owned instruments will be checked daily prior to entering the field using confidence solution and will be calibrated as needed. All results from the calibrations and daily calibration checks will be logged in the field logbook specific to the monitoring project.

3.1. YSI 556 Meter

Electrolyte solution must be added to the DO membrane cap of the YSI 556 meter before initial use. Install the membrane cap as follows:

1. Unscrew and remove probe sensor guard.
2. Discard old membrane cap.
3. Thoroughly rinse the sensor tip with distilled water (not deionized [DI] water).
4. Prepare electrolyte solution.
5. Fill membrane cap half full with electrolyte solution.
6. Reattach membrane cap onto sensor, moderately tightly. A small amount of solution should overflow.
7. DO NOT touch the membrane surface.
8. Screw probe sensor guard on moderately tightly.

All of the sensors, except the one for temperature, require calibration if air pressure changes occur. Calibration tips are as follows:

- Ensure that all sensors are completely immersed in calibration solutions.
- The top vent hole of the conductivity sensor must also be immersed during some of the calibrations.
- Loosen the transport/calibration cup during DO calibration to allow pressure equilibration.
- For maximum accuracy, use a small amount of previously used calibration solution to pre-rinse the probe module. It may be desirable to save the old calibration standards for this purpose.
- Rinse the probe module between calibration solutions with ambient temperature water.
- Use paper towels or clean cotton cloths to dry the probe between rinses. Making sure the probe is dry reduces carry over contamination of calibration solutions and increases the accuracy of the calibration.
- Install port plugs in all the ports where the sensors are not installed. It is extremely important to keep these electrical connectors dry.

The YSI 556 meters will be calibrated for three parameters: DO, pH, and specific conductance. Calibration procedures are provided below.

- Before calibrating the instrument, clean the sensors with an Alconox solution and rinse several times with distilled water.
- Shake off excess water before immersing the probe in the calibration cup with solution. Make sure that the sensors are covered when running the calibration. Used calibration solution can be used to rinse the sensors before calibration to provide an extra level of accuracy.

The steps for entering the calibration mode are as follows:

1. Press the **On/Off** key to display the Run screen.
2. Press **Escape** to display the main menu.
3. Use the arrow keys to highlight the Calibration selection.

4. Press **Enter**. The Calibration screen is displayed.

3.1.1. Conductivity Calibration

1. Record the calibration solution lot number.
2. On the Calibration screen, select Conductivity and press **Enter**.
3. Select Specific Conductance and press **Enter**. (Calibrating for specific conductance will also calibrate for conductivity and salinity).
4. Place 55 milliliters (mL) of the conductivity solution in the clean, dry calibration cup, and immerse the sensors in the solution.
5. Rotate or move the probe module up and down to remove any bubbles from the conductivity cell. Make sure that the conductivity sensor is completely immersed past the vent hole.
6. Tighten the calibration cup onto the probe module.
7. Allow at least 1 minute for the temperature to stabilize. Note the temperature of the calibration solution for the pH calibrations.
8. When the specific conductivity reading is stable for 30 seconds, press **Enter**.
9. Enter the calibration value as reported on the used calibration solution bottle. (The value for specific conductivity is always in microSiemens per centimeter at 25 °C.) Press **Enter** again to accept the calibration.
10. Record the pre-calibration and final, or post-calibration specific conductivity readings. Press **Escape** to return to the calibrate screen.
11. Rinse the sensors and calibration cup and save the solution for a pre-rinse prior to the next calibration.

3.1.2. Dissolved Oxygen Calibration

Before calibrating for DO, empty the calibration cup. Then place the probe into the unsecured cup. Place the cup in water which is at a temperature similar to field temperatures (it may be necessary to add ice to the water, especially in winter).

1. On the Calibration screen, select Dissolved Oxygen and press **Enter**.
2. Select DO% and press **Enter**. (Calibrating for DO% will also calibrate DO in milligrams per liter).
3. Make sure that the DO and temperature sensors are NOT immersed in the water.
4. Secure the cup to the module by only one or two threads to ensure that the DO sensor is vented to the atmosphere.
5. Use the keypad to accept the internal barometric pressure reading.
6. Allow 10 minutes for the air temperature in the calibration cup to equilibrate. When the DO% reading shows no significant change for 30 seconds, press **Enter**. Press **Enter** again to accept the calibration.
7. Record pre-calibration reading and post-calibration reading.
8. Press **Escape** to return to the Calibration menu.

3.1.3. pH Calibration

1. Record the calibration solution lot number.

2. On the Calibration screen, select pH and press **Enter**.
3. Select 3 point and press **Enter**. A 3-point calibration is used to calibrate for surface water measurements that are both basic and acidic.
4. Place 30 mL of the first pH buffer in the clean, dry calibration cup, and immerse the sensors in the solution.
5. Rotate or move the probe module up and down to remove any bubbles from the pH sensor. Make sure that the sensor is completely immersed.
6. Tighten the calibration cup onto the probe module.
7. Enter the value of the pH buffer at the current temperature. The temperature of the stored calibration solutions should have been recorded during the conductivity calibration.
8. Press **Enter** and allow at least 1 minute for the temperature to stabilize.
9. When the pH reading is stable for 30 seconds, press **Enter**. Press **Enter** again to accept the calibration.
10. Record the pre-calibration and post-calibration readings.
11. Press **Enter** to return to the specified pH calibration screen.
12. Rinse the probe module, calibration cup, and sensors in DI water and dry.
13. Repeat steps 3 through 10 for the second and third buffer solutions.
14. Press **Escape** to return to the Calibration screen.
15. Rinse the sensors and calibration cup and save the solution for a pre-rinse before the next calibration.

3.1.4. Return to Factory Settings

1. Press the **On/Off** key to display the Run screen.
2. Press the **Escape** key to display the Main Menu.
3. Use the arrows to highlight the Calibration selection.
4. Press **Enter**. The Calibration screen is displayed.
5. Use the arrow keys to highlight the Conductivity selection. Note: The conductivity sensor is being used as an example; however, this process will work for any sensor.
6. Press **Enter**.
7. Use the arrow keys to highlight the Specific Conductance selection.
8. Press **Enter**.
9. Press and hold down the **Enter** key and press the **Escape** key.
10. Use the arrow keys to highlight the YES selection. This returns a sensor to the factor settings.
11. Press **Enter**.
12. Press **Escape**.

3.2. YSI 600 OMS V2 Sonde

The probes used in the YSI 600 OMS V2 sondes are the same as those in the YSI 556, with the exception of the optical turbidity sensors. The method for preparing the sonde for calibration is also the same as for the YSI 556 as described above. However, to calibrate the probes on the sonde, it must first be attached to a PC with the appropriate software installed or to the 650 display.

1. With the proper cable, connect the sonde to a PC and access EcoWatch for Windows, or to a 650 display. Navigate to the Main menu and select **2-Calibrate**.
2. To select any of the parameters from the Calibrate menu, input the number that is next to the parameter. Once you have chosen a parameter, some of the parameters will have a number that appears in parentheses. These are the default values and will be used during calibration if you press **Enter** without inputting another value. Be sure not to accept the default values unless you have assured that they are correct. If no default value appears, you must type a numerical value and press **Enter**.
3. After you input the calibration value, or accept the default, press **Enter**. A real-time display will appear on the screen. Carefully observe the stabilization of the readings of the parameter that is being calibrated. When the readings have been stable for approximately 30 seconds, press **Enter** to accept the calibration.
4. Press **Enter** to return to the Calibrate menu and proceed to the next calibration.

3.2.1. Turbidity 3-Point Calibration

The 6136 turbidity sensor can be calibrated using either the standard length calibration cup or with an extended length calibration cup. If you choose to calibrate with the standard calibration cup, you also MUST first make certain that the vessel is equipped with a BLACK bottom. In addition, you should engage only ONE THREAD when screwing the calibration cup onto the sonde in order to keep the turbidity probe face as far as possible from the calibration cup bottom to avoid interference. Even with these techniques, there will still be a small interference from the bottom of the calibration cup that will cause your field turbidity readings to be approximately 0.5 nephelometric turbidity units (NTU) lower than the actual reading. This small error is usually only evident when the sonde is deployed in very clear water where the readings might appear as slightly negative values, e.g., a turbidity of 0.1 NTU would appear as -0.4 NTU.

1. Place enough 0 NTU standard (clear DI or distilled water) to completely submerse the turbidity sensor into the calibration cup.
2. Immerse the sonde in the water. Input the value 0 NTU at the prompt, and press **Enter**. The screen will display real-time readings that will allow you to determine when the readings have stabilized.
3. Activate the wiper 1-2 times by pressing **3-Clean Optics** as shown on the screen, to remove any bubbles.
4. After stabilization is complete, press **Enter** to confirm the first calibration and then press **Enter** to continue.
5. Dry the sonde carefully and then place the sonde in the second turbidity standard (100 or 126 NTU) using the same container as for the 0 NTU standard.
6. Input the correct turbidity value in NTU, press **Enter**, and view the stabilization of the values on the screen in real time.
7. Activate the wiper with the **3** key or manually rotate the sonde to remove bubbles.

8. After the readings have stabilized, press Enter to confirm the calibration and then press **Enter** to return to the Calibrate menu.

3.3. Hach 2100P Turbidimeter

Routine calibration checks will be performed on the Hach® 2100P turbidimeter using Gelex secondary turbidity standards. The Gelex standards must have values assigned to them by TTT immediately after calibration has been performed with a formazin standard. These standards will be used as a calibration check before running samples each day. If the readings are outside 5 percent accuracy, the instrument will be recalibrated using StablCal stabilized formazin standards before being used for recorded measurements. A recalibration will be performed a minimum of once every three months by TTT. Methods for checking the calibration are outlined below.

3.3.1. Calibration

1. If the StablCal standards have been sitting for longer than one month, shake them to break the condensed suspension into its original particle size. If the standards are used weekly, start at Step 2, below. Standards of less than 0.1 NTU should not be shaken.
    a. Shake the standard vigorously for 2 to 3 minutes to resuspend any particles.
    b. Allow the standard to stand undisturbed for 5 minutes.
2. Gently invert the bottle 5 to 7 times.
3. Prepare the standard vial.
    a. Clean the cell with a lint-free tissue (on the outside of the cell only) and a DI water rinse. Do not use paper towels on cell.
    b. Allow the cell to air dry. Handle the cell by the top to avoid scratching or contaminating the glass surface.
    c. Apply a small bead of silicone oil to the surface of the cell and rub with a lint-free cloth. The cloth will absorb oil, and after a few applications, it will be sufficient to rub the cloth over the cell. Avoid using too much oil; the cell should appear dry with little or no visible oil.
4. Turn on the instrument by pressing **I/O**.
5. Press **CAL**. The CAL and S0 icons will display, indicating that it is prepared to calibrate the first standard at 0 NTU.
6. Rinse the sample cell one time with the standard and discard the rinse.
7. Fill the cell with the first standard. Cap the cell and let it stand for 1 minute.
8. Insert the cell in the compartment by aligning the orientation mark on the cell with the mark on the front of the compartment.
9. Close the lid.
10. Press the → arrow key to get a numerical display.
11. Press **Read**. The instrument will count from 60 to 0 and then switch to the next standard.
12. Repeat steps 6 though 11 for the three remaining standards.

13. When the last standard is done, the display will increment back to S0. Press **CAL** to accept the calibration, and the instrument will return to measurement mode.
14. If E1, E2, or CAL? is flashing after the **CAL** button is pressed, check the standards and repeat the calibration. Refer to the instrument manual for troubleshooting guidelines.

3.3.2. Checking Calibration

1. Check the instrument calibration using the Gelex standards.
2. If the readings are not within 5 percent of the previously established values, recalibrate using the StablCal stabilized formazin standard.

3.4. Hach pH Pocket Pro

3.4.1. pH Hach pH Pocket Pro

1. Set the power to on.
2. Remove the cap from the sensor.
3. Push the button that looks like a chart to go to calibration mode.
4. Rinse the probe and cap with DI water and pat dry.
5. Pour the auto-recognition standards shown into the cap to the fill line.
6. Put the sensor fully into the cap.
7. When the measurement is stable, push the chart button to save the measurement. The measured value flashes three times.
8. Complete steps 4-7 for each of the three pH standards.

Appendix H
Street Sweep Monitoring Plan

This page intentionally left blank.

Table of Contents

H. Street Sweep Monitoring Plan

1.0 Introduction

1.1 Background

The U.S. Environmental Protection Agency (EPA) issued the Municipality of Anchorage (MOA) and the Alaska Department of Transportation and Public Facilities (ADOT&PF) a Municipal Separate Storm Sewer System (MS4) permit under the National Pollutant Discharge Elimination System (NPDES) in 1999. EPA re-issued the permit effective February, 2010, and with the switch to jurisdiction under the Alaska Pollutant Discharge Elimination System (APDES) the Alaska Department of Environmental Conservation reissued the permit in August 2015. The new permit identifies a number of objectives to be included in the annual report. The specific permit reporting requirements relevant to this street sweep monitoring plan are contained in paragraph 3.4.5.4.2. In addition to annually reporting on street sweeping activities, the permit asks for relevant qualitative information such as ‘visually clean’ evaluation, volume or weight of annual materials removed, and a particle size distribution of swept materials. This sampling effort will go a step beyond qualitative information to collect quantitative data on ‘visually clean’ evaluations. This additional effort will provide consistent feed back on sweeping performance and how changes in sweeping methods may affect street sediment residuals. This data will help guide MOA’s Maintenance and Operations division (M&O) toward more efficient operations. To accomplish this objective, a new monitoring program is proposed building on past study efforts and utilizing similar methods and procedures.

1.2 Problem Definition

Previous studies of sediment loads on Anchorage streets indicate that these loadings are significantly above those found nationally in other cities with similar cold climates and street maintenance practices. It is believed that this difference is due to a longer winter period and less solar heating. Both of these factors contribute to an inability of maintenance crews to have any significant impact on sediment build-up over the winter months resulting in large quantities of street sediments frozen into the ice and snow residues on the streets when the spring melt begins. In spite of an extensive street sweeping program this large initial spring load carries through the summer months with cycles of sweeping and build up, resulting in higher overall street sediment loading. This higher than average street sediment loading is suspected to contribute to higher levels of particulates in stormwater runoff, which in turn impacts the MS4 system, its structural controls and receiving waters. Toward this end, maintaining and monitoring an efficient street sweeping program is an integral part of improving stormwater quality.

While this monitoring plan is aimed at street sweeping effects to stormwater quality it is worth noting that street sweeping is one of the primary methods employed to combat elevated levels of particulate matter in air quality. Street sweeping also serves a third function of keeping streets visually clean for the upkeep and preservation of neighborhoods. A monitoring program must be implemented with an understanding of these multiple functions.

1.3 Goals and Objectives

The goal of the MOA's street sweeping monitoring is to obtain statistical data to quantify the quality and efficiency of the MOA's street sweeping program, review the program's effectiveness at removing material, and quantify the results of modifications made to the program methods.

The street sweeping monitoring program will utilize abbreviated methods and sites from the more extensive 2013 study to quantify sweeping quality. It will:

- Provide a baseline for quantifying the efficiency of sweeping done to a level of "visually clean" per maintenance crew protocol on the two road type strata of residential and arterial/collector.
- Use data from two sampling events, pre-and post-summer sweep, as a surrogate for sweeping performance.
- Provide feedback on sweeping method and equipment changes over the life of the permit.
- Provide yearly data estimating total mass removed and particle size distribution of sweeper collected sediments utilizing accumulated volume measurements, truck counts, and composite sample analysis.

2.0 Description of Program

2.1 Sampling Design

The street sweeping sampling design is targeted at obtaining two pieces of data to satisfy the MS4 permit and to help guide changes and improvements in the MOA's sweeping operations. The street sampling protocols are intended to give information for a "visually clean" evaluation and quantify removal efficiencies to guide sweeping protocols. The annual quantity and particle size distribution (PSD) evaluations are intended to fulfill the permit requirements for annual reporting of materials removed and PSD of a representative sample. These two sampling efforts and their respective methods are described herein.

2.1.1 Street Sweeping residual sampling:

Sampling design for the street sweeping residual is largely based on the most recent street sweeping evaluations done by Watershed Management Services (WMS) in 2013. This study is summarized in document (WMS, 2014). As in the previous work, sampling will be stratified by arterial/collector and residential if practical and site selection will be based on criteria given below. In the event that sweeping practices can be better and more safely quantified on lower traffic volume roads, this sampling effort could be concentrate exclusively on residential sites.

Street sediment residuals left on the road surfaces after sweeping will be sampled twice yearly during the summer months. The first sampling will be scheduled after the initial spring sweep and will quantify both the effectiveness of the spring sweeping operations and provide a baseline for the second sweeping event. The second sampling will follow closely to the second sweeping event and provide efficiency data on that event. All data will represent residual street loading and are intended as a measure of sweeping efficiency.

2.1.2 Yearly Sweep Removal Quantity sampling:

During street sweeping operatioins street sweeping sediments are collected by MOA M&O at at either the Kleop maintenance station on Northwood Street or the Commercial Drive snow storage facility. Street sweeping sediments are collected and stratified by the sweeping event and road type (arterial or residential).At the culmination of each sweeping event the accumulated sediment piles at these facilities will measured by section methods to determine volumes. After the piles are measured the sediments at the Kleop site are moved to the Commercial Drive site. After all sediments are transferred to the Commercial Drive site the piles will represent the total street sweeping removal effort for that year. To further quantify this yearly effort the accumulation will be quantified during transfer of the material to the Anchorage Regional Landfill where it is used for landfill cover. A composite sample of this material will be collected and sent to a soils lab for PSD analysis.

2.2 Schedule of Sampling

Street sweep residual sampling will be conducted twice each year. The first sampling round will be after the initial spring sweep event scheduled from April 1 to June 15. The second sampling will come as close as practical after the summer sweep event (scheduled for June 15 to September 15) has taken place at the respective site and before the start of the fall sweeping event. As a practical matter M&O will provide WMS with daily updates of where and when sweeping is taking place and sampling will be done directly after both the spring and summer sweeping events.

Yearly Removal Quantities will be measured and calculated after each sweeping event and again at the culmination of the sweeping season.

3.0 Methodology and Rationale

3.1 Street Sweep Residual Site Selection

Site selection will make use of the protocols and the resultant sites used in the 2013 street sampling study except as noted. Use of these sites will provide continuity tying the new data and protocols to already existing data and increase the usefulness of this new data in a temporal sense extending from the 2013 season to the end of the permitting cycle in 2019. The 2013 study was based on national standard practices as determined by a technical literature search and review. See the original study for further documentation of this process. Site selection was based on the following needs:

- To stratify sampling stations by land use/ street type/ average daily traffic counts.
- For sampling efficiency so that sampling events can be done in a single day by a single crew. Targeted sites will be in close proximity so that sampling may coincide with street sweeping, which is completed by sector.
- Sites will meet certain physical criteria relating to sampling protocols and safety issues.

The following is a list of the 15 sites sampled during the 2013 study. ADOT&PF maintained sites are excluded from the monitoring effort in 2016. Possible Arterial replacement sites are listed under Arterials.

3.1.1 Arterial Sites

1. 3rd Avenue (Ave) just west of Reeve Boulevard (Blvd), north side, *Too dirty, not representative due to heavy truck traffic.
2. 4th Ave west of Gambell Street, south side
3. 5th Ave between F and G Street, north side, *DOT maintained
4. 6th Ave between E and F Street, north side, *DOT maintained
5. 9th Ave west of Fairbanks Street, north side
6. I Street north of 11th Ave, west side, *DOT maintained
7. Northern Lights Blvd east of Baxter Rd., south side, *DOT maintained
8. Northern Lights Blvd west of Turnagain St., north side
9. Old Seward south of 100th Ave, west side, *DOT maintained
10. Old Seward north of 36 Ave, east side, *DOT maintained

*Removed from consideration, with reason

Replacement arterial sites

11. Arctic Blvd, North of International Airport. Road
12. 36th Ave
13. 15th Ave
14. Spenard Road
15. Lake Otis Parkway

3.1.2 Residential sites

Fairview neighborhood and south of the Park Strip

1. Fairbanks Street south of 12th Ave, east side
2. G Street north of 13th Ave, west side
3. 12th Ave east of F Street, south side
4. 10th Ave east of H Street, south side
5. 10th Ave east of Cordova Street, south side

Tudor Midtown area

6. 34th Ave west of Fairbanks Street, north side
7. 40th Ave west of Fairbanks Street, north side
8. B Street east of 40th Ave, south side
9. A Street south of 45th Ave, west side
10. Ingra Street north of 46th Court, west side

Airport Heights

11. Aspen Grove Court west of Sunrise Drive, north side

12. Toklat Street south of 17th Ave, west side
13. Logan Street north of 20th Ave, east side
14. Kuskokwim Street south of 17th Ave, west side
15. Birchwood Street north of 16th Ave, east side

3.1.3 Other Factors

Priority sites will be selected from analysis of the 2013 data to determine which sites produced the most consistent results and represented the mean values of the sampling effort. To focus more specifically on sweeping performance, sites will be eliminated that have influences that can affect sediment loading unrelated to sweeping:

- Excessive alleyway track out
- Deteriorating pavement sections
- High organic loading from adjacent vegetation and tree overhang
- Depressed gutter sections

3.2 Street Sweep Residual Sampling Methods

Street sweep sampling methods will follow the methods from the 2013 study truncated where appropriate to scale for annual maintenance monitoring. Methods are listed below; truncated methods are indicated where applicable.

3.2.1 Site set up and subsample selection

- Select sites based on preselected sites and methodologies as listed below. The 2013 study contained 25 sampling sites which will be reduced to 4 sites for this annual monitoring effort.
- Stratify sampling by station land use/street type (i.e. residential and arterial/collector as applicable per paragraph 2.1.1)
- Each site will contain 10 transects evenly distributed along the first 200 linear feet of curb line starting at the end of the curvature that denotes the intersection. This is a change from the 2013 study that targeted randomly selected transect covering entire blocks. This effort is targeted at comparative sweeping performance and seeks consistency across sweeping events rather than statistically robust sampling for street sediment loading rates.
- Transects for each site are located along one outside curb. Outside curbs are those along the edges of a roadway as apposed to the curbs along medians.
- Transects will be marked on the curb and at the 4 foot mark with red and blue marks denoting the first (red) and second (blue) sampling events. The following is a list of stations for each event in feet from the beginning station in feet:
    - First Sampling (Red): 10, 32, 50, 72, 90, 112, 130, 152, 170, 192
    - Second Sampling (Blue): 12, 30, 52, 70, 92, 110, 132, 150, 172, 190
- Street dirt loading will be represented by subsampling 10 transects per site.
- Sampling will be of the curb gutters and transects extending 4 feet from the curb. This is also a change from the 2013 study. Literature sited in the 2013 study indicates that a majority- of

the total loading is to be found in the first 4 feet. Truncated transects will be used for safety of personnel and brevity (cost) of the sampling effort.

- Sampling will be done with a vacuum generating 120 cubic feet per minute (CFM) airflow utilizing a custom 12 gage aluminum plate with a 6 inch by 0.5 inch slot attached to the standard vacuum head.
- Samplers shall adjust random transect selection to sample around obstructions and avoid clearly anomalous loadings (parked vehicles, depressed gutters, water, debris spills, etc.)
- If during the course of the study a site is repaved, damaged, or repaired for any reason and becomes unrepresentative, an alternative site will be selected from the original list of sites. Arterial sites will be substituted for arterial sites and residential for residential as appropriate.

Some error is expected as a result of non-replacement of the samples. However, given the overall system variability and the small number of total samples the error introduced by non-replacement is not believed to significantly bias the results at the level this data's intended use.

3.2.2 Sampling work elements

Setup

- Attend project setup meeting with WMS to outline sampling effort.
- Obtain equipment from WMS.
- Set up sampling, Chain of Custody, field notes, and maps.
- Weigh vacuum bags and write tare weight on bags. Average tare weight may be used if bag weight varies less than 5 percent.
- Inspect stations, mark transects on curb. Make any changes needed in site selections.

Field Sampling

- Follow general sampling and data recording instructions as outlined below and in startup.
- Mark whiteboard with site number and take two standard photos with whiteboard in photo.
- Use field forms and station maps for all field data entry.
- Note any deviations from standard practices and reasons for the deviations.
- Completely fill out the field form, enter Not Applicable (NA) or none on blank lines as appropriate.
- Complete sampling as described below.
- Attach completed field sketch on station map to completed field form.
- Label vacuum sample bags, seal in plastic Ziploc bags after collecting sample, label plastic bag with sample.
- Transmit all samples to lab as single batch at completion of each sampling event.

Data Entry

- Enter data from all events to a single project Excel spreadsheet provided by WMS.
- All spreadsheet fields must be completed for each record.
- Metadata must be appropriately documented and provided within the spreadsheet.

Reporting

- Directory structure should include folders for each station and subfolder by event number.
- Label photos as StnID_e_ddmmyyyy, (Station ID [StnID], event number [e], day/month/year [ddmmyyy])
- Scan the field forms and field sketches for each station to a separate pdf document, use the same file identifier as for photos.
- Archive forms and photos to the appropriate subfolder for the station and event.
- Submit electronic files and hard copies of field forms, and sketches along with a brief summary of work done and problems encountered at the end of each field season to WMS.

Results

- Submit a technical memorandum summarizing the results and analysis to WMS at the end of the field season.

Sampling Protocol

- Sampling will be performed by two person crews for safety and logistical reasons.
- Samplers will coordinate with WMS and M&O to schedule sampling after the sites have been swept. Every effort should be made to sample the site within 48 hours of the sweep event and prior to any measurable precipitation event. If the site is swept during a precipitation event the sampling will be postponed until the street sediments have dried to a sufficient level to be accessible to the vacuum sampling method.
- Park vehicle along curb or on the sidewalk of sampling area near the center of the site, establish traffic safety precautions as specified in the project safety plan and prepare all equipment, field forms, and materials for sampling.
- Vacuum will be powered via portable generator and extension cords. Lay out extension cord along the site. Ensure that extension cords do not pose a tripping or electrical hazard to the crew or pedestrians.
- Label paper vacuum bag with station ID, date, A for arterial or R for residential and bag number (1 of 1).
- Label the whiteboard with the station and date, locate the number 0+0 transect and take a photo up station along the curb line from a standing position at the curb. Include the white board in the photo. Take a second photo at right angles to the curb line looking across the street; again include the whiteboard and the near curb in the photo.
- Sampling will be done from the adjacent sidewalk with one person collecting the sample while the other crew member spots traffic. Sampler will not enter the traveled way.
- Vacuum to the 4 foot extents mark or measure 4 feet from the face of the curb if the transect has been moved from the marked location. Work the wand to remove all street dirt except large organic debris, litter, and large rocks greater than a quarter of an inch. Utilize a trowel, scraper, or stiff broom to loosen sediments if they will not move with pure suction. Utilize care to not shift sediments into or out of the sampled area with this process.
- Standardized field forms will be prepared and utilized for each site. A copy of this field form is contained in this appendix.
- Sketch location of completed transects on the field map.

- Move to the second transect and vacuum into the same bag, repeat for all 10 assigned transects. If the vacuum bag cannot hold the sediments from 6 or more transects, label and use additional bags. Label additional bags (2 of 2 etc.).
- After sampling is completed, mark a plastic bag with the station ID and date, remove the vacuum bag from the vacuum being careful not to lose any of the sample, then fold or seal the vacuum bag(s) and place it in the plastic bag.

Laboratory Submittal

- At the end of each day, record on a Chain of Custody form the stations sampled and number of filter bags collected at each, compile completed field forms and sketches.
- At the end of each event, submit all sample bags to soils lab for testing. Sign and transmit a copy of the Chain of Custody form to the lab to document delivery.
- Digitally compile event field records, photos, maps, Chain of Custody form, and laboratory results for transmittal to WMS.

3.3 Yearly Sweep Removal Sampling Methods

3.3.1 Work elements

These work elements assume that M&O will measure and document the volume of street sweep sediment piles at the conclusion of each sweeping event, document the number and volume of truck loads needed to transfer the waste piles to their final destination, and provide those records to WMS at the conclusion of the sweeping season. The following elements are for collection of a composited sample of yearly waste.

Setup

- Attend project setup meeting with WMS to outline sampling effort.
- Receive confirmation from M&O that fall sweeping has been completed and all street sweeping waste piles have been transferred to the Commercial Drive snow storage site.
- Visit site with M&O manager to identify location of sweep waste piles and access site for sampling.
- Set up sampling, Chain of Custody form, and field notes.
- Obtain and label clean dry 5 gallon bucket, and a clean soil sampling shovel, and survey rod,
- Access waste site.

Field Sampling

- Mark whiteboard with date and direction and take four to six standard photos with whiteboard in photo, include field partner holding survey rod for scale.
- Use field forms and station maps for all field data entry.
- Select 10 representative sampling locations midway up the side of the pile or piles. Excavate into the piles 1 foot and collect a 1 quart sample from the subsurface sediments with the soil

shovel. Aggregate the 10 samples into the 5 gallon bucket and seal the lid. The bucket should be about half full. Invert the sealed bucket several times to thoroughly mix the sediments.

- Collect a 600 gram, (approximately one pint) sample in a Ziploc bag, label the bag with sample ID (YrlySwpRemoval_ddmmyyyy).
- Note any deviations from standard practices and reasons for the deviations.
- Completely fill out the field form, enter NA or none on blank lines, as appropriate.
- Attach completed field sketches to the completed field form.
- Transmit the sample to the lab at completion of each sampling event.
- Notify WMS and M&O that measurements and sampling have taken place so that transfer of waste piles can begin.
- M&O will transfer sediments to their final destination and record truck counts (with truck volume) accounting for the total yearly sweeping sediments. M&O will make this data available for inclusion with the yearly reporting records.

Data Entry

- Data from this event will consist of a total volume by measurement, a total volume or weight by truck count or scale tickets sum (provided by M&O), and a laboratory determined PSD of the aggregated sample. This data will be entered into an Excel database and provided to WMS.

Reporting

- Directory structure should include folders for each yearly total event.
- Label photos as "YrlySwpRemoval_e_ddmmyyyy", e is the pile number
- Scan the field forms, sketches, calculations and laboratory reports to pdf format. Use "YrlySwpRemoval_ddmmyyyy_data type" to identify files.
- Archive spreadsheets, lab reports, forms, and photos to the appropriate folder for the event.
- Submit electronic files and hard copies of field forms and sketches along with a brief summary of work done and problems encountered at the end of each field season to WMS.

4.0 Laboratory Testing

WMS will requires custom soils laboratory services for the two sampling efforts as described below.

4.1 Street Sweeping Residual Samples

Work will include receipt, preparation, drying, weighing, and processing of individual combined bag/samples. Work will also include sorting of the individual samples into two strata, as noted on each bag, for each event and compositing of all event individual samples into two samples, representing the two strata. Each of the mixed samples (2 per event, a total of 4 over the project period) will then require subsampling and testing for particle size distribution.

Work services will specifically include:

Receive samples, remove and discard duct tape, and open filter bags for drying. Dry each sample in its paper filter bag (cut bag as necessary to speed drying). Weigh each sample with its paper filter bag and record the total weight (bag plus1 sample). Subtract the mean tare of the dry vacuum filter bags and record the sample weight.

Record and report dried weights of sample plus bag. Calculate, record, and report sample weights (street sediment minus bag tare).

Sort all samples from each event into two strata (arterial and residential, noted on each bag). Cut and shake filter bags to remove most sample from each bag and discard filter bag. Mix all samples of same strata of an event (yield: two composite samples per event). Test each of the two mixtures for particle size distribution utilizing ASTM D 422 (or the superseded) methods. Record and report test results.

Reporting

Provide laboratory test records (table of bag plus sample weights, table of sample weights, and PSD results for composited mixtures). Identify each tested sample or sample mixture using WMS-assigned sample identities and sample collection locations and dates.

Schedule

Report draft results (weights only) for each sampling event within 10 working days of receipt of samples. Report final result for each event within 30 working days of receipt of samples.

4.2 Yearly Street Sweeping Removal Sample.

Work services will include:

- A particle size distribution on a single sample. This sample will be a composite from year end street sweeper waste piles and will come to the lab as a single 600 gram sample in a labeled and sealed “freezer” bag. Work scope is method ASTM D422. Sampling will be done a single time between mid-September and mid-October.
- Reporting: Provide laboratory test records (sample weights, and PSD results for composited sample). Identify tested sample WMS-assigned sample identities and sample collection locations and dates.

5.0 Training

Each field crew member must be familiar with traffic and field safety, sampling, preservation, packaging, Chain of Custody, laboratory deliver procedures, and reporting methods prior to conducting field work or must be accompanied by a knowledgeable individual who will perform the training and ensure competency prior to the start of the field effort:

6.0 References

Municipality of Anchorage Watershed Management Program, 2014. Anchorage Street Sweeping and Storm Water Controls: 2013 Performance Evaluation. WMP APr14001. January 2014.

Attachment H-1

Field Forms

This page intentionally left blank.

YEARLY STREET SEDIMENT RESIDUAL PILE VOLUME CALCULATION

FIELD FORM

1. **StnID** *:* ______________________ **2.Composite Sample ID**___________________________
2. **Date:** ____ (mo)/ ____ (day)/ _______ (yyyy)
5. **Total piles Sampled** *(Attach sketch):* ________
7. **Number of Photos and Description of Each**: Total___________

____

____

____

____

Pile Number _______(Identify on Sketch). Height of Pile______

Shape and Dimensions of Base _______ft. x _______ft. or radius ______ ft.

Shape and dimension of crest _______ft. x _______ft. or radius ______ ft.

Measure of side slopes___________ degrees, percent slope, rise/run

Hand Calculation of Volume:____

Pile Number _______(Identify on Sketch). Height of Pile______

Shape and Dimensions of Base _______ft. x _______ft. or radius ______ ft.

Shape and dimension of crest _______ft. x _______ft. or radius ______ ft.

Measure of side slopes___________ degrees, percent slope, rise/run

Hand Calculation of Volume:____

Pile Number _______(Identify on Sketch). Height of Pile______

Shape and Dimensions of Base _______ft. x _______ft. or radius ______ ft.

Shape and dimension of crest _______ft. x _______ft. or radius ______ ft.

Measure of side slopes___________ degrees, percent slope, rise/run

Hand Calculation of Volume:____

Pile Number _______(Identify on Sketch). Height of Pile______

Shape and Dimensions of Base _______ft. x _______ft. or radius ______ ft.

Shape and dimension of crest _______ft. x _______ft. or radius ______ ft.

Measure of side slopes___________ degrees, percent slope, rise/run

Hand Calculation of Volume:____

Pile Number _______(Identify on Sketch). Height of Pile______
Shape and Dimensions of Base _______ft. x _______ft. or radius ______ ft.
Shape and dimension of crest _______ft. x _______ft. or radius ______ ft.
Measure of side slopes___________ degrees, percent slope, rise/run
Hand Calculation of Volume:____

Pile Number _______(Identify on Sketch). Height of Pile______
Shape and Dimensions of Base _______ft. x _______ft. or radius ______ ft.
Shape and dimension of crest _______ft. x _______ft. or radius ______ ft.
Measure of side slopes___________ degrees, percent slope, rise/run
Hand Calculation of Volume:____

Pile Number _______(Identify on Sketch). Height of Pile______
Shape and Dimensions of Base _______ft. x _______ft. or radius ______ ft.
Shape and dimension of crest _______ft. x _______ft. or radius ______ ft.
Measure of side slopes___________ degrees, percent slope, rise/run
Hand Calculation of Volume:____

Pile Number _______(Identify on Sketch). Height of Pile______
Shape and Dimensions of Base _______ft. x _______ft. or radius ______ ft.
Shape and dimension of crest _______ft. x _______ft. or radius ______ ft.
Measure of side slopes___________ degrees, percent slope, rise/run
Hand Calculation of Volume:____

Total Volume of all piles in cubic yards

<u>Field QC Check boxes:</u>

Field form complete ☐ Field sketch complete/dated/attached ☐
Sample labeled and sealed ☐ Composite Sample mass greater than 600 gm ☐
photos taken/w whiteboard ☐ Sampler(s) ____________________________

YEARLY STREET SEDIMENT RESIDUAL PILES

FIELD SKETCH

1. **StnID** *:* ______________________
2. **Date:** ____ (mo)/ ____ (day)/ _______ (yyyy)
3. **Samplers____________________, ____________________________**

Show approximate number, location, and size of sediment waste piles

STREET SWEEP REMOVAL SAMPLING

FIELD FORM

1. **StnID** *(see list/map):* __________ **2. Intersection:** _________________________

4. **Date:** ____ (mo)/ ____ (day)/ _______ (yyyy) **4. Event** *(WMS-assigned):*________________

6. **Total station segments** *(see map):* ________ **6. Road Type:** Arterial ☐ Residential ☐

8. **Transect width** (TrnsctWdth): _____________________ *(wand opening, n.nn ft—to 1/8 in.)*

9. **No. whole transects sampled** (TotTrnsctNum): __________ If less than 10, why? *(6 min.)*

10. **List Station of all transects sampled:**

__________ __________ __________ __________ __________ __________ __________

11. **Total transect length** (TotTrnsctLngth) sampled **in all Segments** *(12+15+18):* ________

12. **Notes**:

Field QC Check boxes:

Field form complete	☐	Field sketch complete/dated/attached	☐
Sample labeled and sealed	☐	Sample mass greater than 100 gm	☐
2 photos taken/w whiteboard	☐	Sampler(s) ____________________________	

SOILS TESTING SAMPLES TRANSMITTAL FORM
Anchorage Street Sediment Sampling

Event Number: __________ Delivery Date: __________

	Samples delivered:						
	Station ID	Road Type	Event	Date Sampled	No. Vac. Bags	No. Samples	

Lab Name: _______________________________________

Delivered by: _______________________________________ Date: ________________

Received by: _______________________________________ Date: ________________